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ABSTRACT

Papers presented at the 25th annual conference of the Australia College of Education addressed four major themes: The Brave New World of 1984; The Communications Revolution; Being Human in a Technological Age; and Implications of the Technological Society of Education. Papers in this volume include: (1) "The Challenge of Education in the Brave New World" (Ninian Stephen); (2) "Facing the Brave New World: Will the Sleepers Wake in Time?" (B. O. Jones); (3) The Buntine Oration: "Education--On Hanging in There" (M. D. Kirby); (4) "Television in the Satellite Age" (E. Fell); (5) "Some Aspects of the Communications Revolution" (R. Mere); (6) "Being Human in a Technological Age: A Social Response" (D. Green); (7) "Being Human in a Technological Age: An Educational Response" (J. D. McCaughey); (8) "The Future of Schooling in the Age of Technology" (L. Connors); (9) "Towards a More Innovative Australia" (P. Ellyard); (10) "On Being Humanly and Scientifically Educated" (A. Peacocke); and (11) "The Commonwealth Government's Objectives and Priorities for Education and Technology" (R. Johnson). (THC)

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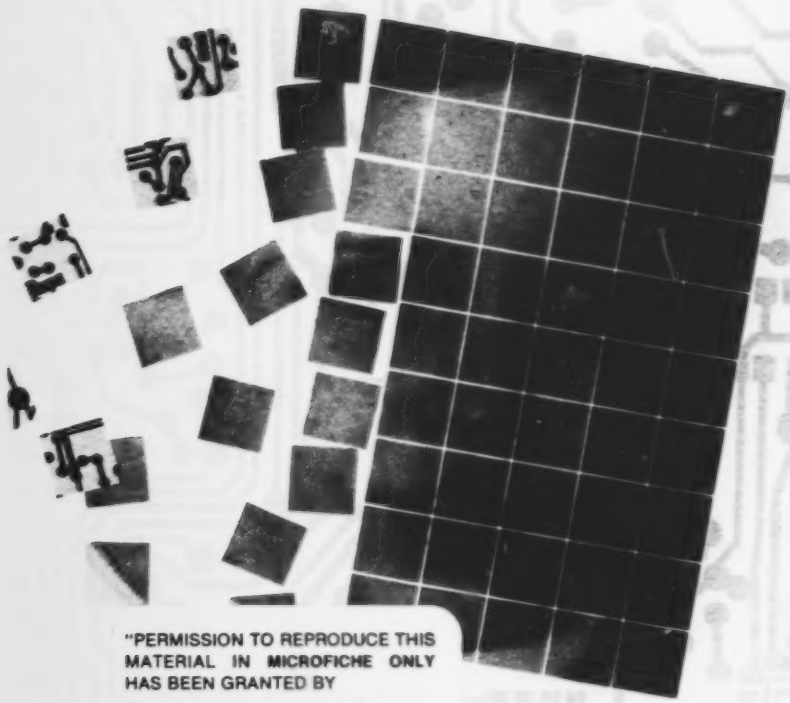
THE HUMAN FACE OF TECHNOLOGICAL CHANGE



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THE AUSTRALIAN COLLEGE OF EDUCATION

The Australian College of Education

THE HUMAN FACE OF TECHNOLOGICAL CHANGE

Theme papers from the Silver Jubilee Conference
of the
Australian College of Education
held in
Canberra 5-9 May 1984
and incorporating
The Twelfth Buntine Oration

Shirley Randell
Editor

The Australian College of Education
Carlton, Victoria
1984

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PREFACE

Any conference of the Australian College of Education is a remarkable blend of harmonies and dissonances. A conference on the human face of technological change, which embraces the themes of faith, science and the future, multiplies the notes and overtones. The Silver Jubilee Conference of the College will be remembered, among other things, for:

- the exceptional quality and diversity of the keynote speakers who drew from a wide variety of experience as well as considerable professional knowledge;
- the basic construction of the program which differed from past conferences in concentrating on one theme for each day, having a male and female speaker on each theme, and allowing group discussion to frame questions to be put to speakers at the plenary sessions, with the whole morning devoted to the theme to enable feedback from the participants;
- the significant contribution of women in the planning, organisation and input to the conference;
- the involvement of children and young people in musical events which occurred daily and led participants to joyous celebration of the gifts of song and mime;
- the experience of ecumenical worship in the beautiful John XXIII chapel at the Australian National University;
- the wit and seriousness of Sir James Darling, beloved founder, in his speech at the Conference dinner;
- the challenge of another esteemed founder, Alby Jones, the 1984 College Medallist, as he called on participants to bridge the gaps;
- the beauty of the venues for the opening ceremony and the Buntine Oration;
- the friendships renewed and new ones made over five exciting days of intellectual stimulation;
- the splendid theme which caused participants to explore seriously what it means to be human in a technological age.

The purpose of this report is to share the major contributions to the plenary sessions of the conference with a wider audience. As these papers were planned to fit gradual development of the theme, they make a cohesive collection. Papers given at concurrent sessions, many of which provide excellent supplementary insights to the issues raised in the major papers, are available as offprints from the Executive Director of the College.

The Conference was a celebration of the first twenty-five years of the Australian College of Education. Readers are invited to share that celebration as they read this report and in their discussions of the major questions raised about what it means to be human in a technological age.

October 1984 — Shirley Randell

OVERVIEW

SHIRLEY RANDELL

Background

The Australian Capital Territory Chapter Committee of the Australian College of Education appointed a Conference Planning Committee in 1983 to plan for the 1984 Silver Jubilee Conference. The women who formed the majority on the Planning Committee persuaded their colleagues that the theme should embrace humanity as well as technology; faith as well as science. The Committee therefore chose the title 'The Human Face of Technological Change' and planned four sub-themes for each day:

- The Brave New World of 1984
- The Communications Revolution
- Being Human in a Technological Age
- The Implications of the Technological Society for Education.

In seeking speakers, the Committee considered people from a range of experiences and disciplines who would be able to draw on the past, be grounded in the present and have a vision for the future. They planned the participation of both men and women to give a full human dimension to the topic.

Although some key people who originally accepted invitations to speak were unable to attend, the final speakers brought diverse experiences and abilities to the conference. All but one were drawn from the Australian community. They included a judge, a scientist, a writer, a politician, a psychologist, two theologians, three public servants, three university educators, and the Governor-General of Australia (see list of contributors).

The Conference

Over 300 Fellows and Members from all Chapters of the College gathered on the campus of the Australian National University in Canberra for the Silver Jubilee Conference, which was held on 5-9 May 1984.

In opening the conference the Chairperson of the A.C.T. Chapter, Dr Helen Granowski, issued participants with a challenge:

- to hear each day contrasting views from contrasting speakers about their experience of specific aspects of the theme;
- to discuss in working groups these insights in depth and openly focus on participants' own experiences;
- to pose questions and draw out further insights and experiences from the speakers in plenary sessions;
- to apply what was learnt by working out what was relevant to each participant's situation and how they should act.

Dr Granowski pointed to the efforts the conference organisers had made to emphasise the human touch throughout the conference. These included the name

tags written by hand rather than being computer-printed; the colour code which replaced a numbering system, which had a poetic rather than a logical or random basis; the student musicians who were performing drama specifically created as a response to technological change; and the opportunity to practice human discrimination through 'the sensitivity of taste buds' at the wine-tasting ceremony. The emphasis of the conference, Dr Granowski reminded participants, was not to be on *technological change* but on the *human response to it*.

The Brave New World of 1984

In opening the Conference, the Governor-General of Australia, Sir Ninian Stephen, was one of three speakers who dealt with the brave new world of 1984.

Sir Ninian pointed out that the arrival of 1984 had been rather anti-climactic. Rather than ushering in a bleak totalitarian world, 1984 had shown a trend towards an awareness of the importance of the rights of the individual. Sir Ninian painted a possible scenario with the coming of new technology, in which there might be a tendency for the well-educated increasingly to inherit the Earth while fewer rewards would go to the disadvantaged. He challenged educators to teach us how to remain human in a technological age and how to retain human values.

The Hon. Barry Jones, Commonwealth Minister for Science and Technology, in his keynote address, also warned about the potentially negative effect of technology on working class jobs. He identified class, culture and religion as the three major factors which determine life outcomes and employment opportunities. The human qualities of intelligence and imagination were necessary to make the most effective use of technology so that technological change was not used to widen social and economic divisions in society.

In responding to Mr Jones, Professor Grahame Rigby, Chairperson of the Technological Change Committee of the Australian Science and Technology Council, likened technological change to the process of germination in spring, which produces both flowers and weeds. New technology, intelligently applied, had resulted in the production of goods and services which were of a higher quality, better designed and delivered more economically than ever before. But conversely, complex automatic equipment was controlled by computers which could also readily monitor the performance of the person operating the machine and infringe on the dignity and freedom of individuals. Changes taking place tended to divide the community sharply between those with ability to master the new technology and those who would become its victims. Professor Rigby saw the study of humanities as important in providing the social wisdom to ensure that technological change remained our servant and not our master.

The Buntine Orator for the Silver Jubilee Conference, Justice Michael Kirby, gave particular attention to the issues of the continuing poor educational retention rates in Australia and the funding of education for the poor and disadvantaged. He called for the shifting of funds to the schools, normally public schools, where the children of the poor were being educated. In addition, he said, the availability of student assistance had a marked effect on the ability and willingness of students to enrol and to continue in the education system. He urged the Government, when setting the TEAS allowance, to examine what we were losing by failing to prepare young people for the world of science and technology.

The Communications Revolution

The second theme of the conference dealt with the communications revolution. Ms Elizabeth Fell concentrated on the subject of television in a satellite age while Mr Rein Mere outlined some aspects of the revolution.

Ms Fell explored changes in the electronic media, particularly television, in the context of Australia's new domestic communications satellite system. Her paper contained a warning that the commercial television corporations which were placed to expand their market via the satellite were also those which owned and controlled most of Australia's press. She supported a major restructuring of the television industry to allow for diversification of programming sources in information and entertainment and she encouraged a study of the relationship of audiences to power and control within the system.

Mr Mere said that the heart of the communications revolution was cheap and powerful computing power, coupled with very efficient and readily available communication channels. He pointed to the chasm developing between 'information rich' and 'information poor' countries where developing countries were struggling to create even rudimentary communications networks. Within Australia, educators needed to begin co-ordinated planning in teaching procedures and curriculum development to extract the maximum use from technological advances and, in particular, to harness the potential for equal access and interactive learning at a distance.

Being Human in a Technological Age

The third theme of the conference dwelt on the human face of technological change. Ms Dorothy Green addressed the social aspects and Dr Davis McCaughey the educational aspects of being human in a technological age.

Ms Green postulated that before long the last human characteristic left to us would be the capacity for disobedience, the freedom to criticise, to challenge, to choose. Behind every technological invention which served to isolate people from one another, or to centralise their energy source, lay the desire for power and control. Ms Green emphasised that there was no substitute for unmediated experience, which an encroaching technology often discouraged. We must struggle to retain the right to have such experiences.

In an educational response to the theme, Dr McCaughey explored the question: what can we do educationally to keep people human and to enable them to become more human? He argued that, fundamental to a humanising capacity, was the development of the power of speech. He said we should give renewed attention to the learning of language and languages and to what we should read and how we should read it. Learning a language enabled us to look out upon the world through a window; a piece of writing was a mirror which disclosed to us a world other than our own world, yet within which was reflected our concerns. To be truly and fully human was to allow ourselves to be exposed to the great stories of human existence.

The Implications of the Technological Society for Education

The final theme was addressed by three public servants and a theologian.

Ms Lyndsay Connors discussed the future of schooling in an age of technology. She argued that schools would be important institutions through which our society would attempt to emphasise the human face of technological change. She analysed the impact of contraceptive technology, labor-saving technology and military technology on schools and students. Ms Connors cited recent reports which called for more recognition of the crucial importance of contact between students and education professionals, the provision of an appropriate level and mix of resources to build effective relationships, and the maintenance of high quality in teachers to prepare students adequately for full participation in a democratic society.

Dr Peter Ellyard challenged educators to anticipate change; to determine whether we want to use different technologies rather than merely respond to the perceived technological imperatives. He said there should be greater emphasis on the development of individual life skills in the formal education period as well as work skills in an expanded continuous education system. While Dr Ellyard argued for opportunities for all Australians to become more competent and knowledgeable about technology, he saw the major task of education as helping to shape a society which was more creative, more respecting of innovation and more entrepreneurial than at present.

In his address Professor Arthur Peacocke spoke about the importance of being humanly and scientifically educated. He rejected 'naive scientism', which he said dominated the outlook of many scientists and technologists, and considered the relationship of different modes of knowing. He described science and technology as fallible but exciting, human explorations into the nature of aspects of reality which could contribute to human dignity and welfare. Professor Peacocke stressed the essential interrelations between scientists, technologists and the humanities.

There were two formal responders to Professor Peacocke: Ms Margaret Bearlin, Senior Lecturer at the Canberra College of Advanced Education and Dr Peter Marshall, Director of Zadok Centre in Canberra.

Ms Bearlin responded to a question raised in Professor Peacocke's address: 'How can we obtain a value system to regulate human exploitation of nature?' She argued that a value system was needed which was internal to the activity of science itself, thus determining the nature of scientific knowledge created. Ms Bearlin contrasted two fundamentally different ways in which humans could see themselves in relation to the world of nature. The first way was as collaborators with nature, as part of a continuous, interwoven, interactive, interdependent system of living and non-living things. The second was to seek domination over nature to control it, with the potential to destroy it. Ms Bearlin drew attention to the important work of Nobel Prize winner Barbara McClintock to illustrate the way the domination model had powerfully influenced the formulation of scientific theory. This model had presented enormous difficulties for scientists who viewed humans as collaborators with nature. Their work was often rejected. McClintock's theory of genetic transposition, a participatory model of cellular organisation rather than a model where the cell was directed by the DNA molecule, had taken thirty years to be recognised. Ms Bearlin argued that to reclaim science for humanity, to establish a science for life rather than a science for death, required a rejection of the notion of domination and the acceptance of collaboration with nature, a respect for the interdependence of all life and the full development of human emotions.

In his response, Dr Marshall deplored the separation between secular and sacred areas of knowledge in society and the exclusion of the study of religion or theology from legitimate areas of learning. Educational institutions should encourage the fusion of the old disciplines, including humanities which embrace religion, in an integrated fashion with pursuits of an academic, scientific kind. Secondly, he challenged participants to seek effective ways of developing this more holistic approach to education. Interdisciplinary studies could bring a greater wealth of understanding and breadth of humanity to the people being educated as well as the educators themselves. Thirdly, he drew attention to the way people proceeded from places of learning into public life, taking with them the narrow confines of their subject areas, the limited skills they had developed and their restricted perceptions of life. They then imparted these limited perceptions, sometimes in a very powerful way, to the decision-making processes of corporate and public life. Dr Marshall argued that society was impoverished if people could not begin to see a range of possibilities or listen to the opinions that come from others. A greater breadth of understanding should arise from an appreciation of various forms of knowledge.

The Secretary of the Commonwealth Department of Education and Youth Affairs, Mr Richard Johnson, representing the Commonwealth Minister for Education, was the final speaker on the theme of the implications of technological change for education.

Mr Johnson drew together the Commonwealth Government's objectives and priorities for education and technology and outlined some of the action the Government had already taken. A major goal of the Government was the establishment of a comprehensive strategy for initiatives to encourage the whole education system to stimulate, to shape and to respond adequately to technological and structural change. The potential of the technologies to expand participation and equity at all levels and to break down existing barriers between sectors of education and individual institutions was considerable.

Summary

College President-elect, Dr Peter Botsman, summarised the conference in his inimitable fashion, enlivening his comments with numerous references to the arts. He noted how the chasm metaphor had emerged prominently during the conference with Sir Ninian Stephen's warning of the danger of a greater rift in society occurring with the emergence of an under-class, and Alby Jones' analogy of the way the Australian College of Education had been in the business of 'bridging the gaps' in education. In conveying his view of a bridge, or at least the abutments on which a solid bridge may be built, Dr Botsman dwelt on Professor Peacocke's concept of building a curriculum on eight areas for which there are different ways of knowing.

> If we as educators can accept that there are different 'modes of apprehension' and if we can make our schools recognise and respect all of these modes, then most, if not all, the problems of remaining human in a technological age would, I believe, disappear. Our dominant epistemes, our obsequious deference to a particular kind of paradigm, our mind-forged manacles — all must be broken and challenged. Only then will we gain the solid ground on which a bridge to face the future confidently, can be built.

Professor Selby Smith, one of the College founders, and representing the older members, summed up his impressions of the conference under three headings. He spoke of the renewal of friendships as the practical expression of overcoming barriers, a goal for the College which the founders hoped would be achieved. It had been rewarding to sit down with people from other parts of education, from other parts of Australia, from other age groups, to discuss such important issues so frankly. Secondly, he praised the organisation of the conference and the imaginative choice and arrangement of topics and speakers. Thirdly, Professor Selby Smith commented on the high quality of the addresses as eloquent, moving, and, in some cases, 'mind-blowing'. He supported Sir James Darling, who at the conference dinner, said that participants had been made more clearly aware of the wonderful potentialities of many modern developments in technology, but had been challenged not to forget the vital and enduring importance of human emotions and human relationships which can be practised and exemplified 'every moment of our working lives'.

A representative of younger members, Ms Nicole Gilding, also referred to the excellence of the speakers and the stimulation of the process of the conference. She would have preferred direct questioning of speakers from the floor rather than the process of filtering questions through discussion groups which led to a less interactive exchange. While praising the balance of men and women speakers, Ms Gilding noted that the equal opportunity issues that had been raised within the conference had singularly not been addressed — including the male image of technology derived from the scientists in charge of its production, the industrialists in charge of its application, and the politicians in charge of the decision-making processes to decide how it affects our society. She raised some important questions for organisers of future conferences, including the one of equity. Her questions were:

- how does the College address the needs of those who are represented in the educational system?
- how does the College work with and galvanise into action the younger members of the education force who were not represented at the conference?
- how does the College transfer a range of ideals into a view which is coherent and which allows the College to take informed positive action?
- given the diversity of membership how can a College view, which seems essential to engage in political action, be formed?
- how can we draw together the conflicting issues of social control, equity, cost effectiveness and the qualities of a humanist education?

Finally, Ms Gilding commented on the important issues of powerlessness, power and control which she considered central to any discussion of technology and education. Unless the subjects of race and class and gender division were brought to the surface and discussed in a systematic way, technology would continue to be examined in a way that was relevant only to a very small portion of society.

Conclusion

The conference ended on a note of expectation and optimism. In drawing on the recent writings of British theologian, Leslie Newbigin, Shirley Randell challenged participants to look beyond 1984 to the next twenty-five years, beginning with a resolute challenge to the assumptions of our society by asking five questions:

- What does it mean to be human?

  At present the prevailing view of being human is that each man and woman should have the right to develop his or her potential to the maximum, limited only by the parallel rights of others. The governing principle is equality. On the other side of 1984 we should explore whether the governing principle of 'the human' ought to be mutuality. In this vision there is no true humanity without relatedness — dignity may be found through surrendering autonomy to each other and becoming interdependent.

- What is the goal of human life?

  At present our culture generally accepts as self evident that 'the pursuit of happiness' is the proper goal of human life. On the other side of 1984 we should recognise that human dignity is not secured, but lost in the plethora of good things which modern technology makes available for our 'happiness'. In a world where only a small minority has access to this wealth and the majority still wage a desperate struggle for existence we have to ask, is there an appropriate model for world development which can be rooted in mutual responsibility for all?

- What are the capabilities and rights of governments?

  At present the emphasis is on equal rights rather than mutual obligations, and the duties of governments to provide for human happiness. On the other side of 1984 we should seek ways of expressing the mutual responsibility which all must share for the welfare of all. Could a vision of human dignity assist the development of a model which interlocks the roles of national, state and local governments and voluntary agencies in mutual responsibility?

- What is our vision of the future?

  At present it seems that the vast majority of people have ceased to think hopefully about any earthly future. But without hope, action is impossible. On the other side of 1984, we should seek a firm and realistic vision of the future. Could our actions become signs of hope in the working out of nature and history towards the achievement of peace?

- What is involved in knowing?

  At present we are tempted to believe that the methods of science are the supposed key to knowledge. On the other side of 1984, we should recognise that the critical faculty is not primary but secondary, and can only operate on the basis of beliefs which are held in faith. Could we recognise that knowledge in its fullest sense calls for commitments and attitudes which place at the centre a relationship of trust in a personal reality much greater than ourselves?

To raise these questions, and others that leap out of the pages of this report, will mean that educators will have to discuss with scientists, philosophers and each other, serious issues about the nature of education. Science and technology must become part of an understanding from which ethics cannot be separated, because all knowing is an activity of persons responsible to one another. The Council of the Australian College of Education hopes that conference participants and readers of this report will follow up these questions both personally and in their professional capacities.

In closing the conference College President, Professor William Walker shared his optimism that society would continue to adjust to major technological change as it had adjusted to major sociological change and major multicultural change. He saw the Australian College of Education as a valuable participant in shaping that future.

THEME 1:

THE BRAVE NEW WORLD OF 1984

The Challenge of Education in the Brave New World
Ninian Stephen

Facing the Brave New World: will the sleepers wake in time?
Barry Jones

The Buntine Oration: Education — on hanging in there
Michael Kirby

THE CHALLENGE OF EDUCATION IN THE BRAVE NEW WORLD

SIR NINIAN STEPHEN

I am very pleased to be able to share this special occasion of the 25th Anniversary of the Australian College of Education with you. It is reassuring that even in the entirely rational minds of educators, ancient myths surrounding magic numbers still play a part and that you join the common herd in regarding twenty-five as more significant than twenty-four or twenty-six. Perhaps less reassuring that in this scientific age, new chronological myths may still be created. The mystique which surrounds this year of our Lord 1984 is just such a piece of modern magic and is given recognition at this conference by the tandem title of one of its four sub-themes: 'The Brave New World of 1984'.

For much of the past thirty-five years this year of 1984 has been anticipated, if not with the dread with which mediaeval Christendom faced the year 1,000, at least with a certain sense of anxiety; in part a fear of the effects of new technology. Now that it has arrived it has been all rather anti-climactic. Not only has Orwell's bleak totalitarian world not come to pass; if anything the year has shown a continuing trend towards more awareness than ever of the importance of the rights of the individual. Greater awareness, too, of the drab desolation of the soul which descends when systems of government discount the individual in favour of the State or of whatever other impersonal euphemism may be used to cloak dictatorial power. This was surely Orwell's message and it has, I think, been heeded. It had, I believe, little to do with technology *per se*. Technology is at best a tool, value free and available to humankind to use for good or for evil. Its gift is only that of greater power, it alters not at all the use we choose to make of that power.

If technological change does not necessarily herald either brave new world or Orwellian nightmare, what it may do is demand a keener awareness and closer assessment of what should be our social goals, if only because it makes goals of all kinds easier to achieve. It is therefore entirely appropriate that this conference should be looking at the human face of technological change, at what those changes can do for us and what educators should be doing about them.

That great changes are in the offing which will affect education and educators seems clear. Developments in the means of producing our food and of manufacturing the goods and supplying the services we need or want, have in the past resulted in massive population relocations and gross changes in the nature and conditions of employment. Europe's Industrial Revolution of the past and this century's drift to the cities by rural populations of less-developed countries provide vivid illustrations of this. And the introduction of high technology into manufacturing and service industries of the present day is already threatening to make any long-term, substantial reduction of presently unacceptable rates of unemployment difficult to achieve.

To a layperson in the educational field, there would seem to be at least two fairly obvious consequences for education of the coming of new technologies: the need for educators to be equipped to take advantage of new aids to teaching and to the acquisition and use of information, and the equally urgent need to equip their

students with the skills to use those aids themselves, both in their studies and in their lives outside the class and lecture rooms.

But if as a layperson I may venture to suggest what seems to me to be another perhaps less obvious implication, it is that more than ever before there will be a tendency for the intelligent and well educated to find themselves increasingly inheriting the Earth, while for the slow and the disadvantaged there is going to be less place in society and fewer rewards than ever. The more routine work is done by silicon chips, the less social value will be placed upon those who, perhaps only because of inadequate schooling or vocational training, are capable of no more than such routine work. The consequence may be a great cleavage between the skilled users of high technology in all its forms, for whom knowledge will indeed mean power, wealth and the good things of life, and those who are unskilled or incapable. The latter may then indeed be at risk of becoming a caste of unfortunate proles, leading bleak lives without even the satisfaction of good craftsmanship or of manual labor well done.

If this bleak scenario has any validity, it may suggest that education has important roles to perform in helping to prevent it coming to pass: one of those roles could well be described in terms of another of your conference sub-themes: 'Being Human in a Technological Age'. Education can produce attitudes of mind on the part of those educated in the mysteries of the new technology which will allow them to appreciate that any such society as my scenario suggests, would be neither a good nor a virtuous one, nor one of enduring advantage even to the great majority of skilled users of technology themselves. Its survival would depend upon the forcible suppression of the unskilled, requiring a totalitarian society ruled by force, whose domination would in the end be likely to extend to the skilled and the unskilled alike.

On that view the challenge of education is very much one of teaching how to remain human in a technological age, how to retain those human values which have been developed over the ages, using technology to foster and to encourage rather than to suppress and to destroy.

Side by side with that may go, not at the expense of education in the skills needed in high technology but in parallel with it, a learning of how better to appreciate all those cultural and aesthetic pleasures and activities which largely lie beyond the reach of technology; pleasures whose enjoyment calls for no technology either when passively enjoyed or actively participated in and which are open to all. These range, I suppose, all the way from literature, music and the performing arts to growing vegetables and bush walking. If we are about to enter a new age of high technology let us at least all learn to enjoy it!

FACING THE BRAVE NEW WORLD: WILL THE SLEEPERS WAKE IN TIME?

BARRY JONES

Australia: An Information Society

Australia is an information society in which more people are employed in collecting, storing, retrieving, amending and disseminating data than in producing food, fibres and minerals, and manufacturing products. The information society is marked by a shift away from employment in producing goods and services towards that of services and information, and an unprecedentedly rapid increase in the volume of readily accessible knowledge, often called 'the information explosion', a phenomenon which poses social and political problems. Access to knowledge, capital or wealth is roughly equivalent and there is a widening gap between the information rich and the information poor whereby the unskilled become an intellectual proletariat. The problem of control in an information society is largely unrecognised and undiscussed, and yet it raises the 'Who/Whom?' question which Lenin described as the basis of all political debate: 'Who does what to whom?' Is access to information to be centralised and subject to monopolist or oligopolist control, or is it to be dispersed, decentralised and widely available?

The fragmentation of knowledge may lead to an incapacity or unwillingness to examine technical questions in a wide social context, with a failure to connect and, overall, an inability to comprehend what is going on. This is likely to lead to a loss of power by democratic institutions, and to increase the power of strategically placed minority groups occupying the commanding heights in particular areas of society: technocrats, public servants, corporations and unions.

Australia is an information society — but essentially a *passive* one, an almost inevitable consequence of the fact that we have inherited the English language and see ourselves, with some justice, as a mere branch office of the English-speaking world.

Early in its history Australia adopted a split level education system. The upper levels — for the officers of Australia's social army — came from the first division, the public school system, largely the Protestant ascendency but later including house-trained Catholics. The public schools have been the corner of a foreign field which was forever England: just like the ABC.

This system was based on the implicit — and often explicit — assumption of a hierarchical society, buttressed by monarchy, religion and property in which it was assumed that only a comparatively small elite was capable of benefitting from higher education or was, to coin a phrase, 'born to rule': the world view of Sir Robert Menzies.

Raymond Williams, in his radical classic *The Long Revolution*, has pointed to 'the very odd principle that has been built into modern English education: that those

who are slowest to learn should have the shortest time to learn, while those who learn quickly will be able to extend the process for as much as seven years beyond them. This is the reality of "equality of opportunity" which is a very different thing from real social equality'. (Williams, 1961: 167-8).

The assumption that most working class children were virtually ineducable was a universal belief in the 19th century, and was restated officially as recently as the late 1940s, as if it was scientifically established, relying on the findings of Sir Cyril Burt that only 10 per cent of young people could benefit from tertiary studies. This assumption is taking a long time to break down.

It is no coincidence that Britain and the two school systems most closely based on it — Australia and New Zealand — share a remarkable statistic: that more than 60 per cent of 15-19 year olds are in the labor force, that is, 'in work or actively seeking it'.

The second division — the state schools — have been marked by low expectations and, inevitably, low performance.

Technology, Unemployment, Class and Culture

The impact of technology on our present employment cannot be understood in isolation: class, cultural and regional factors must be taken into account as well. Technology has a negative effect on working-class jobs such as high volume process production work and a positive effect on small volume high value-added professional work. Manufacturing and construction have overwhelmingly working-class labor forces, with a very high migrant component in most States. In our White Anglo-Saxon Protestant society, in the golden age of 'full employment' which ran to 1973, the most physically arduous, boring and dangerous jobs were reserved for working class migrants. Now, with the growing use of robots, numerically controlled tools and CAD/CAM (computer aided design and manufacture) many, if not most, of these jobs will disappear within a decade. The blue collar labor force will become an endangered species. In 1947, 64.8 per cent of Australia's labor force was 'blue collar', falling to 41.6 per cent by 1981. However, employment in white collar work will continue to increase and the impact of new computer-based technology makes it possible to create more productive professional and semi-professional jobs at lower unit cost.

The least educated are at grave risk: the highly educated, with some exceptions such as the over 50s, are barely at risk at all. Unemployment is overwhelmingly a class phenomenon, highly concentrated in areas marked by over-specialisation in manufacturing, such as the central and western suburbs of Sydney and Melbourne, much of Adelaide and the 'iron triangle', parts of Tasmania and Perth, Geelong and Wollongong-Port Kembla where the 1981 unemployment figures were twice the national average and would be considerably worse now.

One major impact of technology is to require a higher mean skill level (probably exacerbated by minimum wage levels), and the jobs previously held by the unskilled have disappeared. Who would employ a 15-year-old unskilled youth? To do what? whatever the wage rate — and certainly not for a high one?

Class, culture and region are the major factors which determine life outcomes

and the role of technology is catalytic, speeding up employment decline or growth in particular areas. A recent confidential report on New South Wales State high schools made by the Education Department and published in the *Sydney Morning Herald* pointed to the extraordinary regional variation in retention rates to Higher School Certificate: in the State electorate of Bligh (Woollahara, Darling Point, Centennial Park) more than 90 per cent of pupils completed their secondary education, while in the Riverstone and Broken Hill seats the figure was less than 15 per cent, a variation of more than 6:1. The same survey showed that 93.5 per cent of pupils in independent schools completed Year 12, 40.4 per cent from Catholic schools and only 28.1 per cent from State high schools.

Postcodes determine lifestyles and life chances far more than technology: identify someone's postcode and a fair estimate can be made of his or her educational background and prospects for satisfying work.

The barriers to reduced unemployment levels in working-class and rural areas are cultural, psychological and environmental, not just economic and technological. Some regions with the highest productivity, such as my electorate of Lalor and its neighbour Gellibrand in Melbourne's west, have among the worst employment rates. In many areas high productivity and quality of life are inversely related so that the area fails to attract new people, new skills and new capital which could diversify the traditional employment bases. Instead the trend towards over-specialisation and obsolescence is speeded up, especially when there is an inadequate educational base.

Many pupils from independent schools are quite likely to be fluent in Chinese or French; to have visited China and in some cases France, to be experienced in using computer VDUs, lasers and synthesisers; to recognise that the 'career open to talents' is a positive challenge and not a threat. Many of their working-class contemporaries in the State system contemplate a world of irrelevant skills, declining work opportunities, mounting frustration and the threat of increased alienation, anomie, drug dependence (if they could afford it) and self destruction.

The collapse of employment in manufacturing is not causing great distress in Bellevue Hill, Toorak or St Lucia. Students from Cranbrook or Scotch College feel no alarm if they cannot get apprenticeships in sheet metal working or jobs on car assembly lines. Girls from PLC or Merton Hall don't lie awake at night, fretting that they won't get jobs at Safeway or McDonalds. Whoever imagined that they would?

There is a cultural chasm in employment expectations between the working class and the middle class. Middle-class people with their adaptability and flexibility, enter the labor force late, often in their 20s, move in and out of careers and localities as easily as they move in and out of marriages; they break continuity with working holidays and overseas travel; and they can leave work early or late as it suits them without worrying too much about whether they will have 34, 40, 45 or 50 years of it. They are generally relaxed about adapting to new technology. People employed in the new 'Information' sector are overwhelmingly middle class. Working-class people suffer from considerable cultural rigidity, often being anchored to a particular job type and to a specific region. Home ownership is a factor which ties them to declining regions — 'Who would buy my house if I move?' they ask. They often start work at 15, expecting a 50 year end-on stretch (long service leave

notwithstanding). They dare not get off the treadmill, even temporarily, for fear of not getting back on. At 65, many self destruct when compulsory exclusion from work means the curtailment of income, loss of life's purpose and an end to the primary social relationship, often followed by rapid physical deterioration.

The Canadian psychologist William Lambert Gardiner argues that modern society conditions people to overvalue 'extrinsic worth' — measured by employment and the acquisition of material possessions — and to undervalue 'intrinsic worth'.

> We are confronted with our own emptiness. Extrinsic motivation has destroyed intrinsic motivation . . . A disproportionate number of people die shortly after retirement. They are so conditioned to see themselves as an interchangeable part of a system that, when declared obsolete, they self-destruct. You can't use your spare time to gain intrinsic worth but you can use your spare money to gain extrinsic worth. You are compensated for your lifetime with money and you use that money in a vain effort to buy it back.

We ignore at our peril the fact that the impact of unemployment is overwhelmingly class, regional and ethnic.

We have been slow to recognise that employment levels are essentially culturally determined. Who have more children at work — the workers or the bourgeoisie? Clearly, the workers. Do the bourgeoisie worry about it? No, they do not. Are there more Japanese or Australians at work, pro rata? Australians. But we record our unemployment at 9.6 per cent; they record theirs at 2.4 per cent. We have also been slow to grasp the significance of our unusually high participation rates in employment, as mentioned earlier.

Learning in Australian Schools

Australian schools have succeeded in making learning boring for many — perhaps, even most — young people and I confess to finding a depressingly low level of curiosity among many professional educators. I see the greatest non-economic problem of Australian society as being boredom. This condition relates to our singular lack of clear-cut goals and our aimless misuse of the most important non-renewable resource, namely time. Boredom is the common theme which links together drinking, smoking, gambling, voyeurism (whether through television or spectator sport), drug and analgesic dependence and delinquency.

Life in Australia

Life in Australia is pretty boring for most people, although they conceal it through work, physical activity generally and social habits which essentially just involve mucking about. Thus, most people postpone the need to face up to the fundamental questions — Who are we? What are we here for? Where are we going?

In the 19th century the passionate advocates of technological 'progress', followed by the Futurists of the 20th century argued that the use of labor-saving technology would revolutionise humanity; that freedom from dull, exhausting and repetitive labor would lead to the liberation of humankind and there would follow an explosive growth in human capacity; that the arts and sciences would develop dramatically and that Periclean Athens and the Italian Renaissance would pale into insignificance; that there would be no more cruelty, no more crime, no more war: a Golden Age indeed.

Well, whatever happened? We have the technology, but we don't have the Golden Age. It is as if the technological age caught humankind in the shallows, with a yearning for things rather than revelations.

The Psychological Threat of Computer-based Technology

I have argued in many speeches about the psychological threat of computer-based technology. The necessary pre-conditions to the most effective use of computers are that society should be marked by intelligence and imagination. When a society, or individuals in it, are intelligent and imaginative then computers, like TV, can enlarge and deepen human experience by giving a freer range to qualities of intellect and spirit. So I would happily propose the formula:

Intelligence + Imagination + Technology = Advance.

But I am concerned that where those human qualities are lacking and a high degree of machine dependence is apparent, then the formula may be:

Technology - Intelligence - Imagination = Regression.

In *Paradoxes of Progress* (1978) the American molecular biologist Gunther Stent has argued that 'progress . . . is by its very nature, by its very dependence on the will to power, *self-limiting*'. He argues that it is no coincidence that the phenomenon of the 'beat generation', the beatniks and hippies of the mid-1960s and thereafter with their adoption of the Polynesian lifestyle, Zen Buddhism, transcendental meditation, the Moonies and other religious or quasi-religious cults, and later with increasing dependence on psychedelic drugs should have been strongest in California, the most technologically advanced part of the world's most technologically advanced nation (and especially in San Francisco).

It is sometimes asserted that the technological revolution of this century gives unprecedented opportunities for personal development and for enhancing human capacity. Shakespeare with an IBM golfball typewriter would, it is felt, have been far more productive than Shakespeare with a quill pen (a very primitive piece of technology) and Shakespeare with a word processor would be more productive than either. The tragedy is that with the quill pen we have Shakespeare, Mozart and Goethe while with the word processor we have Barbara Cartland, John Laws and Ita Buttrose.

Stent asserts that 'in the human psyche there exists a will to have power over the events of the outer world' and that 'sublimation of that will to power' — that is, directing energies towards some useful purpose — 'is the psychological mainstream of all creative activity'. This will to power is not, of course, to be seen narrowly as winning a war, winning an election, taking over a company or thumping somebody, but it might be a matter of self fulfilment — writing, working in the arts, or achieving personal understanding. However if that will to power is diverted by the fulfilment of material needs, there may not be much time or enthusiasm left for the exercise of creative energy. The fulfilment of physical needs may weaken the will to power. We are then content to have others do things for us — or not to bother about doing much at all.

Stent believes that the ever-mounting degree of economic security experienced by a majority of people in the United States of America — and in our own lucky country, despite the presence of the submerged seventh who do not share it — inhibits

the will to power, the will to know and the will to change. There is some tension within our society — a dichotomy recognised in the value system of our political parties — between those who are looking for class gains (rewarding groups in society generally) rather than individual gains, or vice versa. The 'Age of Affluence' which followed World War II, and ran until the early 1970s, was unprecedented in economic history and 'engendered a corresponding change in social ethos which deflated the idea of success'.

Stent concludes that western society is now well on the 'Road to Polynesia', but with three major problems still to be overcome: the trilemma proposed by Dennis Gabor in his *Inventing the Future*: nuclear war, overpopulation, and the social problems arising from 'the Age of Leisure'. Technology is in itself a major contributor to all three problems; first by creating nuclear armaments, second by reducing infant mortality and general morbidity rates, and third by reducing the number of people who need to be employed producing necessary goods and services, and bringing about changes at a greater rate than humans seem able to adjust to intellectually. (At a sub-intellectual, instinctive level, they *do* cope with it, by withdrawal or dependence on drugs, and other forms of privatised stupefaction.) Mercifully, the loss of a will to power makes nuclear war seem less probable and the next generation of American and Russian leaders, likely as they are to be in a twilight zone of tranquilisation, may feel that the ideological tensions of the Cold War have become increasingly mystifying and irrelevant to them.

Bruno Bettelheim is only one of a number of writers who point to the paradox that in this age of computer ubiquity and the communications revolution: that there is disturbing evidence of declining literacy skills. In the 1920s, Bettelheim found that the 'first readers' for American school children had an average of 600 words vocabulary while in the 1980s they have less than 100.

The *Victorian Readers* I grew up with introduced primary children to a wide range of experience — not as immediate in visual impact as television to be sure — but with valuable exposure to vocabulary and complex sentence structure. The Fifth Reader included Dickens, Scott, Defoe, Edward Lear and Lafcadio Hearn and the Sixth Aesop, Cicero, Homer, Voltaire, Tolstoy and Dumas. Now obviously only a hopeless reactionary would suggest that fifth and six graders in 1984 ought to read widely, but I feel growing anxiety that there is a gaping hole between our literary skills and our visual ones. My anxiety is sustained by the recent report of the Adult Literacy Council that 10 per cent of our adults are functionally illiterate and by the Williams Report (1979) which found that 49 per cent of New South Wales school leavers were either sub- or semi-literate and numerate. Is this an Information Revolution or a Counter Revolution?

As Dame Leonie Kramer has commented, how can a democratic electorate be expected to make sophisticated political judgements if its citizens are not able to understand the words used to frame the concepts?

Purveyors of mumbo-jumbo, especially lawyers and bureaucrats, are virtually exempt from debate and public scrutiny largely because the citizenry — and I include Ministers in this — can hardly begin to formulate the right questions to ask them.

The development of communications technologies has coincided with a decline in the levels of political consciousness. When Lincoln and Douglas debated in the

US in 1858 for the Senate and later in 1860 for the Presidency, the technique of reporting was very simple but the debates were subtle, complex and profound. When in 1980 the contenders for the Presidency debated in living colour before an expectant world, the technology was infinitely more complex but the requirements of the medium itself debased the quality of the debate. Eugene McCarthy points out that George Washington's Cabinet included John Adams, Thomas Jefferson, Alexander Hamilton and John Jay while 180 years later, in the same positions, Richard Nixon had Spiro Agnew, Henry Kissinger, John Connally and John Mitchell. McCarthy asked 'How much progress can we stand?'

Australia: A Corporate State

Australia is moving towards a 'corporate state' in which major areas of society are run autonomously: for example, industrial relations are left to the employers, unions and the Conciliation and Arbitration Commission, and decisions about hours of work would not be made by Parliament. International trading matters are left to the market; multi-national corporations and media monopolies are too powerful to touch. The areas Parliament can tackle are increasingly limited. Is Australia still a democracy in the traditional sense, when so many vital subjects have been depoliticised? Will technology be in the hands of business? Government? Community groups? Will political decisions be taken, or will they be resolved by 'natural selection', without any political debate? Will Australia have the intelligence, energy or guts to impose democratic and pluralist forms on the new technology, or will its ambiguities all be resolved in favor of the rich, the powerful and the status quo? Our timorous social history; the feeble grasp of complex matters exhibited by too many of our leaders; the low level of intellectual vitality; a lack of national self confidence; our natural tendency towards bureaucracy, conformity, obedience and fatalism; the mediocrity of the business and academic establishment, do not give us much ground for optimism.

Conclusion

The impact of technology will be experienced both in the microcosm — the short term effects in Australia — and in the larger, historic world context. If changes in the pattern of work lead to people being compulsorily retired at 55 or unemployable at 25, we should not be surprised if they turn to liquor, drugs, daytime television, the occult, introspection, boredom or emotional paralysis. We must not waste our greatest national resource: people. If we have an alienated segment of young people permanently excluded from the labor force, we should not be surprised to face urban terrorism along Baader-Meinhof lines in Australia before we are far into the 1980s. In the larger context, matters are even more serious. Machines are doubling their intellectual capacity every few years, but people are not. If artificial intelligence outstrips human intelligence, if technology is smarter than its displaced human equivalent, then the power of the people who own the machines will be expanded to an almost unimaginable degree. What are the implications for our political system? In Australia, the current generation of managers grew up before the technological revolution. They do not fully understand its significance — and have an instinctive anxiety that if the number of Indians is reduced, fewer chiefs will be needed as well. When the existing technology is used at full capacity, or when new generations of managers arrive on the scene, the impact may be enormous

unless we adopt appropriate social responses. It is time to examine the implications.

The fragile consensus which links the Australian community can be shattered if we fail to grasp the interdependence of the skilled and unskilled, rich and poor, market sector and convivial sector. It is essential to recognise the need for employers, trade unions, major political parties and all levels of government to evolve broad policies to ensure that technological change is not used to widen social and economic divisions, and to avoid a legacy of increasing bitterness between the powerful and the impotent.

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THE BUNTINE ORATION 1984
Education — On Hanging In There

JUSTICE MICHAEL KIRBY*

The twelfth Buntine Oration was delivered during the Silver Jubilee Conference on 7 May 1984 in the Academy of Science, Canberra by the Hon. Justice M.D. Kirby, C.M.G., Chairman of The Australian Law Reform Commission.

The biennial Oration was established in 1960 by Dr R.M. Buntine, Dr M.A. Buntine, Dr R.D. Buntine and Mrs B.M.G. Wilson to perpetuate the memory of their father Walter Murray Buntine who was prominent in the development of education in Victoria over a long period during the early years of the present century. After graduation he spent some years in private teaching and then accepted the headmastership of Caulfield Grammar School in 1896 where he remained until he retired in 1932. He played a leading role in settlement of many of the problems of education. He served on Melbourne University Council and on many other important committees in the University and in the Church. In 1935 he represented the Government of Victoria at the first International Conference on Education in Geneva. He was partly responsible for the formation of the Incorporated Association of Registered Teachers of Victoria and its Training Institute for teachers.

Doctor Buntine Today

The Buntine Oration is now established as one of the most important of the nation's *fora* for exploring educational issues. Most of my predecessors in the series have been full-time educators — or people who (like Sir Zelman Cowen) once wore the teacher's mantle. Occasionally a politician intrudes. In this, the twelfth lecture in the series, you have invited a person of dubious qualifications to speak on education. Though my own education was exceedingly long, I have never formally been a teacher. Though I am Chancellor of Macquarie University, and have sat on the governing councils of Sydney University and the University of Newcastle, I have not engaged in university teaching or research. I have neither the inside information of a professional nor the power of a Minister to take or reject the advice of professionals. True it is, in the business of law reform, I have assumed something of a function of community education in my own discipline, the law. But it is often asserted that the law sharpens the mind by narrowing its focus. The problem for the lawyer and the judge is often to perceive the broad currents that are flowing in society. Judges have been likened to a swan on the still waters of a river: graceful and elegant to look at, but paddling furiously underneath. I shall now paddle furiously in the waters of education. I hope you will conclude that I have done so *with* the stream and make allowance for the observations of an occasionally furious non-expert.

Walter Murray Buntine would almost certainly have disapproved of the choice of me as 1984 orator. He was, by the accounts of my predecessors in this series, a somewhat austere man. He was prominent in the development of education in the State of Victoria during the early decades of this century. He was a child of Queen Victoria's reign, being born in 1866. He was appointed Headmaster of

* Personal views only. Chairman of the Australian Law Reform Commission, Chancellor of Macquarie University, Member of the Executive of the Australian National Commission for Unesco.

Caulfield Grammar School in 1896. He continued in that post to the end of 1932 when he retired. Between 1935 and 1938 he was a member of the Council of Melbourne University. He had a seat on the Council of Public Education in Victoria for five years during the 1930s.

Sir James Darling, in his 1972 Buntine Oration on 'Responsibility' talked of the overlap between Buntine's term as Principal of Caulfield Grammar and his own service in that school. According to Sir James:

> What I remember about Dr Buntine . . . was a great rigidity of principle coupled with very human sympathy. Gentlemanliness and kindness were his most obvious qualities, although underneath there was a firmness of Christian character which made compromise with wordly values difficult, if not impossible . . . We cannot today go all the way with these old Evangelical Christians for whom moral questions seem to be so clearly defined and for whom the shades of right and wrong were no better than the wiles of the devil to deceive and to betray. Such views, if held without charity and understanding, could sometimes be cruel and harmful.[1]

It was with trepidation, after reading this, that I saw that in 1940 and until the end of the Second World War, Dr Buntine gave his services continuously as a voluntary communications Censor for the Army. He sounds, as presented by the reminiscences about him, to have been a person of the Old School, literally.

I propose to talk of issues of the New School. The topics that one could choose in addressing issues of education today are virtually limitless. Our newspapers are full of them. It is perhaps symbolic that the cover story of this week's *Bulletin* magazine deals with education at school. Instead of speaking of good old-fashioned things in which Dr Buntine would have felt comfortable, topics such as 'responsibility' (to which Sir James Darling addressed himself) or self-reliance (to which Michael Somare spoke), I propose, with the contra-suggestibility of the Irish, to talk of topics that would almost certainly cause anxiety were the fabled educator we celebrate here with us tonight. My topics will include:

- our continuing poor educational retention rates in Australia, and what we can do to encourage more of our young people to stay with the course;
- the funding of the education of the poor and disadvantaged; not those who attend Caulfield Grammar School, nor even my old school of Fort Street in Sydney, but those who need the special support of the State if they are to remain within the system; and
- finally, the old State aid debate and the funding of public schools and private schools in our country.

Under-educated Australia

Turn first to under-educated Australia. What is the position, why is it happening and what, if anything, should we do to change things?

There is no doubt that Australia's educational system, evolved from England, appears to discourage retention in education beyond school leaving years. In comparison to like societies (other than Britain and the other country so closely modelled on it, New Zealand) our failure to keep young people in education is striking. In comparison with the rapid increase in educational retention in our economic competitors in Asia, the position is very worrying indeed.

I realise that statistics are somewhat eye-glazing. But Dr Ken McKinnon, Vice-Chancellor of the University of Wollongong, recently called a few vital statistics of a non-attractive kind to notice:

- Of every 100 young people who start secondary school in their 7th or 8th year of schooling, approximately 89 are at school at the end of the 10th year. Some 44 continue into the 11th year of schooling and there are further losses so that only 35 out of the 100 who started survive into the Higher School Certificate year.[2]
- In contrast, those who leave before the end of the 12th year of schooling in the United States of America are labelled 'dropouts'. Great efforts are expended in discovering the causes for such 'dropping out' in the United States, simply because it is expected that every young person will complete 12 years at school.
- In 1982 only 12 out of every 100 who started secondary school seven years earlier commenced at a university or college of advanced education in the following year. Between 1976 and 1981 enrolments increased marginally but full-time enrolments actually declined. The transition direct from school to higher education actually declined by 18 per cent in our country.
- The proportion of each age group participating in higher education in Australia was about one-quarter of the equivalent rate in the United States.[3]

The statistics prepared regularly by the Organisation for Economic Co-operation and Development (OECD) show that countries which are considered most technologically advanced have significantly greater participation rates in higher education than Australia has.[4] Taking the percentage of the population aged 19 to 24 years who were in full-time education, in Australia it is 7.3 per cent. But compare that statistic to:

	%
Canada	16.2
Denmark	19.8
Greece	17.6
Italy	19.2
Japan	14.7
Switzerland	19.6
USA	26.7

The only countries with whom we can be compared (apart from Turkey and Yugoslavia) are countries which have inherited the same English model of education: Ireland, New Zealand and England itself. This is one of the least attractive of the inheritances of colonialism. It is educational colonialism. It is a vision of education as being the province of a very small group of highly-talented elite people, almost invariably men and tending to look upon distributive disciplines such as law as much higher in the pecking order than more creative disciplines such as agriculture, engineering and veterinary science. These are attitudes that tend to put words on a pedestal much higher than mathematics and infinitely higher than science and technology.

In 1957 the Murray Committee reported on higher education in Australia. It looked at community needs and, unsurprisingly, concluded that university responses to those needs were inadequate. The Murray Committee affirmed a basic principle:

> Every boy and girl with the necessary brain power must in the national interest be encouraged to come forward for a university education and there must be a suitable place for everyone who does come forward . . . It is the function of the university to offer not merely a technical or specialist education but a full and true education befitting a free man and a citizen of a free country.[5]

We can criticise the sexist language (not then so out of place) in talking of a 'free man'. Indeed, it has always been, and still is, a distinct advantage to be a man in the Australian educational system:

- women represent only 16 per cent of academic staff in Australian universities;
- only 2 per cent of professors in Australia are female;
- only 46 per cent of women academics have tenure compared with 84 per cent of men.

Though these statistics are confined to the university sector, they permeate the whole educational system and cry out for change and equal opportunity.[6]

But though one may criticise the language of the Martin Committee, there was merit in what the committee sought to do. It sought to ensure a university education for all those able to cope. I realised that this attitude might, in turn, be criticised as merely continuing the infatuation with the English elite universities, sometimes distorting the whole educational system in the process. Nonetheless, the ideal of the availability of education for those able to perform in it, was one deserving of approbation and aggregate to all levels of education. In the consequence new universities were built, new places were found and new staff was recruited. How often have I heard it said that this was the great achievement of the Menzies Government? How often is it said that if Sir Robert Menzies looked back on his life and claimed credit for one major thing alone — it would be university expansion in Australia.

Let every due credit be given to Menzies and his government for these achievements. They were notable. They were worthy. They deserve our national appreciation. But the result of it all, many inquiries and new universities later, is still a shockingly low national retention in education. We are still a country that bundles our young people out of education into the workforce too soon. Going on in education is the exception not the norm in under-educated Australia. There are some fellow citizens who are surprised and a little hurt when they read on the eve of Anzac Day the OECD estimate that Australia devotes a relatively low amount of its resources to national research and development and is not expected to improve its position in the near future. We spend 1.04 per cent of our gross domestic product on research and development.[7] We are in this respect spending the lowest proportion of any comparable nation except Italy. The OECD has concluded that our research and development pattern is 'unique' among developed nations. Not 'unique' in a way we can be proud of. While most countries have been increasing expenditure on research and development as a proportion of gross domestic product (reflecting the technological and scientific age in which we live) Australia's spending during the 1970s has fallen. The record of the private sector in Australia is especially pathetic, 78 per cent of the research and development funds actually coming from government through bodies like the CSIRO. Hidden behind their protective barriers of tariffs and other cosy arrangements, Australian manufacturing industries have all too often

become complacent. They have not encouraged research in-house. They have not provided the jobs that will induce young people to embark upon a career of research-oriented education.

The problem of keeping more young Australians in education is recognised at the highest level. Senator Susan Ryan, in her address to the Unesco General Policy Debate in Paris last October,, revealed our predicament frankly before the world community:

> The need for . . . reform is clearly demonstrated by the low participation rates of Australian students in the later years of secondary schooling. Despite our relative affluence and the universal provision of secondary schooling, only one-third of our young people complete a full six years of secondary education. This figure is far too low and compares unfavourably with other OECD countries. It is particularly unacceptable to our government because it is the children of poor families, of some migrant groups and of Aboriginals who are failing to complete secondary school and are thus, at a time of high unemployment, seriously disadvantaged compared to middle class students who generally do complete secondary schooling.[8]

Senator Ryan's conclusion has been questioned.[9] But certainly the Federal Government has been supporting the thesis in a careful way with policies designed to increase participation rates in secondary and tertiary education. Funds have been made available to certain universities and colleges of advanced education in the expectation that 3 000 additional students will be selected from groups designated by the government to be disadvantaged, 'Aborigines, migrants, low income groups, women and the handicapped especially those who live in outer Metropolitan areas'.[10] Specifically, Senator Ryan has rejected, on behalf of the Federal Government, the notion of broad across-the-board expansion of the tertiary system in Australia. The government was not prepared, she has said, simply to 'pour vast amounts of money into tertiary education without qualification'. The government 'would not preside over an uncontrolled expansion of the tertiary system as occurred in the 1960s'. That expansion, she declared, had produced 'a rather stultifying uniformity of values and priorities among all educational institutions'. The injection of money could not in itself solve the problems of higher education in Australia. To gain and maintain political and community support, the higher educational system would have to be 'seen to contribute to national economic recovery and social equity'. Institutions should 'strive for the greater correlation of the social composition of their student bodies and the composition of society at large'.[11]

Keeping Them In

Views of this kind have turned educational pundits to proposing specific ways in which disadvantaged groups can be advantaged:

- In June 1983 Dr Tannock called for a national policy to raise participation in education to the end of the year 12 from 35 per cent at present to 100 per cent by the end of the decade. He pointed out that our rate compared badly with the retention at school in Japan, the United States and Canada. He aimed to entice nearly half a million 16 to 18 year olds back into the education system. But to do this it would be essential to create a variety of educational institutions with more choice and curricula more relevant and interesting to the students leaving education in droves.[12]

- In case Dr Tannock's approach sounds like the 'broad brush' specifically rejected by the Minister nine months later, consider the proposals of Professor Michael Birt, Chairman of the Australian Vice-Chancellor's Committee, made at about the same time as the Minister's speech. Addressing the Annual Conference of the Institute of Directors in March 1984, Professor Birt called for a doubling of the number of student places available in universities and colleges. At present we cater for 350 000 students. Professor Birt called for a restructuring of higher education so that Australia's higher education system would more closely approximate American style 'liberal studies' colleges and specialised universities and institutes — leaving universities to the narrower range of highly specialised activities of teaching and research traditional before the effort was made to cram into them the growing number to meet the demand for improvement in our educational statistics.[13]

- Addressing the special problem of very high dropout rates in country students in rural educational services conducted by the New South Wales Education Commission, a review published last month found that not one of the 24 rural State electorates in New South Wales had a retention rate higher than 40 per cent after year ten. Only ten of those electorates had an average retention of more than 30 per cent. The report found that children and teenagers in country schools, especially girls and children from disadvantaged backgrounds, such as Aborigines, the handicapped and migrant children, were severely disadvantaged. Numerous recommendations were made. They included establishment of special residential schools for isolated children; additional resources for student counselling in country areas; expansion of support programs for teachers in small schools; expansion of curricula in country schools; close monitoring of improvements in retention of disadvantaged groups; full-time Aboriginal educational consultants and so on.

To the problems of disadvantage and geography, of British educational traditions and elite attitudes, we must now add the special consideration of the 1980s. I refer to the acute choice that some young people must make between career security and continuing education.[14] Faced by the uncertain prospects of continuing education and the prospect of an immediate job, the dropout syndrome typical of our country is reinforced in hard times. Indeed, if the dropouts stop to think about it and read the newspapers, they will know that the tertiary degree today is worth much less in the pay packet in Australia than it was 15 years ago. A recent study by the National Institute of Labour Studies at Flinders University found that in 1968-9 the average earnings of male graduates were 2.33 times higher than those of males who had left school at 16. By 1981-2 the advantage had dropped to 1.7 times the earnings of males beginning work at 16. In the younger age groups, the earning advantages of being a tertiary graduate had fallen to only 30 to 40 per cent more than workers without a degree or diploma.[15] The *Australian Bulletin of Labour* concluded:

> Clearly acquiring a degree has become less financially rewarding than it was 15 years ago. The average male graduate will now not recoup his potential foregone while studying until he enters his 30s, whereas in 1968-69 he recouped them by age 25. It is unsurprising, therefore, that the growth of demand by young males for places in tertiary education institutions has considerably slowed and there has been substantial growth in part-time studies.[16]

This development may be reassuring to the supporters of egalitarian Australia. But in terms of rewarding efforts and the deprivation that is inherent in the sacrifice involved in continuing education, it is scarcely an inducement to continue with education, whether at school, college or university.

Some commentators have suggested that the cure lies in making the curriculum more interesting and relevant to a time of vast sociological and technological change. The Independent Teachers' Association of New South Wales recently criticised secondary education in the State as being still dominated by university academics and bureaucrats. The Association called for radical reform of the system claiming that, until there was such reform, secondary education would remain irrevocably locked into university needs and hence irrelevant and unattractive to very large numbers of Australians not interested in university who would just drop out.[17] Others suggest that the course adopted by Federal and State Governments of tackling particular target groups is the right road ahead. Whether these target groups are racially or socially disadvantaged or whether they involve special effort, say, to get more female teachers in mathematics and science to encourage girls to take these subjects, is a matter of debate.[18] Some commentators see in our Australian problem evidence of a deeper world malaise. For example, Professor John Ward, Vice Chancellor of Sydney University, has said that the Western world is in danger of losing support for education. Specifically he questioned whether education was reaching beyond the willingness or ability of people to grasp its message.[19] He urged governments, universities and other educational authorities to find ways to improve the participation of young people in secondary school and tertiary education: 'We need more skilled people and we need an end to the frustrations of early school leavers who have poor employment prospects'.[20]

Paying for It

It is one thing to identify a problem. It is another to reflect upon structures and institutions that can address the problem. It is still another to set up committees of learned commentators and citizens to debate, as we can endlessly debate, the issues of education from the abolition of the cane to budget policies, curricula contents and school retention. But in the end, addressing our scandalous, persisting and even deteriorating figures on educational retention will require great effort of national will. And somebody will have to pay if we are to turn things around.

I agree with Dr Ken McKinnon that the availability of student assistance has a marked effect on the ability and willingness of students to enrol and to continue in the educational system, however we organise it.[21] Dr McKinnon points out that since 1976 in excessof 50,000 teacher education scholarships have been absolished in Australia. The number of students eligible for tertiary education assistance scheme (TEAS) allowances has actually declined by 10,000 from its 1978 peak of approximately 72,000. Of the students who enrolled in 1981, only 42 per cent were eligible for a TEAS allowance. This figure compared with 56 per cent who were eligible in 1976. There are later figures than these cited here and they indicate that some improvement in the overall figure of eligibility is being achieved. The latest figures for 1984 indicate that an expected 69,000 students will be eligible for the TEAS allowance compared with the 62,768 who were eligible in 1981.[22] It is also noted by Dr McKinnon that even amongst those students who receive the TEAS allowance, only one-third of them received the maximum benefits. Many of them

have their benefits reduced by reference to the earnings of their parents. Considered in conjunction with the rise in the real costs of rent, travel, books, stationery, medical charges, an occasional milkshake and so on, the position we have arrived at is quite unacceptable. In fact it is little short of a national scandal. Piously to call for higher school and educational retention whilst chipping away at the funds that are needed to improve that retention is indulging in a dangerous form of hypocrisy or self-deception. I speak bluntly because the problem we face is a serious, persisting and apparently deteriorating one. It has grown more serious over the past decade. Who can doubt that Dr McKinnon is right when he says: 'Considered in conjunction with the rise in real costs . . . the increasing numbers of unemployed parents, the lack of means of support while studying must discourage many potential students especially when the dole provides better support than even the full TEAS allowance'.[23]

What is the position in 1984 so far as TEAS and the dole is concerned? An adult student wishing to matriculate, provided he or she can meet a variety of tests including a means test, can receive a grant of $62 a week. Once the student has matriculated and again can meet all of the requirements, he or she may receive a tertiary allowance as an adult up to a maximum of $62.25 per week. An additional supplementary allowance of $42.70 will be paid for a dependent spouse and $10 for a dependent child.

A school leaver at 18, wishing to gain further education, may obtain, under certain conditions, a tertiary allowance of $40 per week where the combined family income is below $12,983. Above that figure, the allowance is progressively reduced to a cut-off point of $20,132 a year. I understand that this figure relates to the total income of all members of the family residing at home.

The self-same young person can receive unemployment benefits, with no means test other than as to his or her own income, of $45 a week.

The burden on our young people is accentuated where they want to take a course which is not available in the State in which their parents live. Take a lad whose parents live in Adelaide and who wants to take a course in agricultural engineering. If he moves to Toowoomba where he can do that course, someone must pay his board in addition to costs of books, union fees, medical attendance and perhaps a little for entertainment not unimportant during the years of deprivation. But if his family earns over the 'cut-off' figure this lad, living interstate, will not be entitled to any allowance unless, during the long vacation, when seeking a temporary job, he can induce the local Commonwealth Employment Officer to put him on the dole.

As a country we can either pay our young people not to work, with no questions asked, or pay them to study, to improve their skills, their adaptability and their potential contribution to a world of rapidly changing technology. It is hardly surprising that many school leavers opt to be 'unemployed' rather than students. This is particularly so where they cannot obtain entry to their preferred course of study due to quota limitations.

These problems that I have mentioned are only a few of the problems that face young people constantly told by pundits like me to stick at education, to hang in there and to cure the problem of under-educated Australia. There are many other problems. Students are not entitled to any support to cover travel costs. This, it is said, is a State matter not a Federal responsibility. Whereas Victoria provides

nothing, South Australia does allow for student travel at a reduced rate. This also applies to the unemployed. Of course, the unemployed are better off in South Australia, as they travel free of charge between 9 am and 3 pm.

Take a young female student who last year decided to go back to school, matriculate and take a degree in social work to enable her to help people. At the age of 22 she had to prove that she had been in the workforce for 104 weeks and had no income above $2,000 a year, and was living away from home, before she was allowed to move from the dole to secondary education assistance. Such young people, regarding the system as unjust, may turn to its manipulation, may be forced to work part time in order to avoid begging for educational allowances which will not usually be enough to keep them anyway. Or, offered the prospect of a job, they may squander their intellectual birthright and grasp the employment opportunity in hand rather than pursue the mirage of continuing education.

Fortunately, it is clear that the present Minister for Education is fully alive to the injustices and anomalies that exist in tertiary education assistance scheme allowances for students. Senator Susan Ryan has recently declared that she intends 'fighting' for higher allowances during the current Budget deliberations. She said that she agreed with critics that the present TEAS allowance was inadequate, even allowing for the increase in it by 6 per cent in last year's Budget. Speaking at a graduation ceremony at the Canberra CAE, in this city, she referred to an options paper on income support for young people presented to the government in February of this year. One of the main recommendations of that paper was that TEAS allowances be increased to the level of unemployment benefits to encourage young unemployed people to undertake further education. Another option suggested in the paper was for universal youth allowances to replace TEAS and other student allowances with the one benefit that simply depended on the student's age. We can applaud these statements of a sensitive and concerned Minister. But I must say to you that my heart fell when I read the Minister's statement of the obvious but grim-sounding news that 'funds are limited':

> The current TEAS scheme which benefits about 100,000 students costs nearly $240 million a year. If the government were to increase the TEAS allowance by just $1 a week it would cost another $5 million a year. If we lowered the qualifying age for independent status from 25 to 21, it would cost around $150 million in a year.[24]

These are ominous words. But somebody must do the sums on opportunity costs for Australia. Somebody in Treasury, reflecting on the sums that must inevitably be done in the preparation of a Budget, must look to what we are losing by failing to prepare our young people (as the Japanese, Korean, Singaporeans and others are preparing theirs) for the world of science and technology.

Barry Jones says that when he rewrites *Sleepers, Wake!* he will add to the impertinent seven laws, an eighth namely:

> Employment levels are culturally determined.
> It is the culture which determines whether a 16-year-old should be at school or in the labor force or whether the appropriate retirement age is 55, 60, 65 or 70. This is not to discount economic factors (which come first in most analyses) and human psychology at will. However, I would argue that it is postcodes which determine lifestyles and life changes far more than technology.[25]

Conclusion

Postcodes, disadvantaged geography, disadvantaged suburban areas, disadvantaged linguistic and cultural background, disadvantaged Aboriginality, disadvantaged sex; all of these add up to a tremendous educational problem for under-educated Australia. It is a problem not irrelevant to the funding of our schools, particularly not irrelevant to the improvement in the quality of our public schools to arrest the socially expensive shift towards fully-funded private education. That is a debate for another day. I have already nailed my flag to the mast of public education. People who, like me, took advantage of public education, must speak up for it. All too many of them, as they climb the ladder of social success, fall into tongue-tied silence when the proponents of private education, educational democracy, free choice and fully-funded educational diversity speak out loud and clear. My concern is the concern which Senator Ryan herself has identified. It is the concern about those groups who must look, in their overwhelming majority inevitably, to the public school sysstem for their education. If ever we are to tackle their basic problem and to achieve the goal and dream of the education on merit, we must tackle the problem in the public schools where most of the disadvantaged groups exist.

Above the Old Bailey in London is the Biblical inscription: 'Defend the widows and children of the poor'. I have always thought the latter injunction to be a special obligation of a just education system. Defend the children of the poor. Make sure that the children of the poor get a better deal in under-educated Australia. Do it through recognising the extent to which we continue to slip behind our competitors in keeping people in education. Do it by reconsidering the structures of education. Do it by shifting funds to the schools, normally public schools, where the children of the poor are to be found. Do it by increasing the allowances that will permit them to continue in education and removing the anomalous inducement that sometimes makes it more advantageous for them to lie on the beach, drawing the dole or to take a job unworthy of their intellect.

Do it by recognising the opportunity costs that are paid by Australia with its low educational retention, born of its colonial origins and expectations, so shockingly low by comparison to like countries and competitor neighbours. Do it by recognising that it will cost the nation money and that sacrifices will be needed but that what is at stake is something more than 3,000 places in tertiary education or a few counsellors in outback country schools.

We have a great national educational problem on our hands. It has been long identified. It goes to the heart of the capability of our country in the next century to adapt to the times we live in. Those times are the times of mature science and technology. It is the fate of our generation to be born at a moment in history when three great technological changes have occurred at once: nuclear fission, the microchip and biotechnology. How will our population react to these changes if it is not readied for them in the schools? There are some who say that we should just concentrate, as a nation, on the things we can do cheaply: dig out the minerals (but even here the coal mines may be closed), sow the wheat (but even here the drought may come again); graze the cattle (but even here the EEC, by dumping, may steal away our markets) shear the sheep (but even here the wide comb dispute may compound nature's occasional unkindness). If we want to maintain our place in the world, the key to that ambition is to be found in the schoolroom, in the college,

in the university. Down the track we are walking lies under-educated Australia in a world which is increasingly becoming better and more educated. We must make a choice. Otherwise a future generation will say of these years that they were the years that the locusts had eaten, when we were alerted to the dangers, yet showed ourselves incompetent or unwilling to adjust to the vital necessities of change. I am sure that if Dr Buntine were here tonight, he would address us with evangelical fervour about the urgency of our national educational predicament. I think you will have gathered that it is my view at least that a little evangelical fervour on this subject would not go astray.

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THEME 2

THE COMMUNICATIONS REVOLUTION

Television in the Satellite Age
Elizabeth Fell

Some Aspects of the Communications Revolution
Ren Mer

TELEVISION IN THE SATELLITE AGE

ELIZABETH FELL

Introduction

The questions raised by the term 'communications revolution' can be approached from a number of different perspectives. I want to explore changes in the electronic media, particularly television, in the context of Australia's new domestic communications satellite system. As the old established boundaries between publishing, broadcasting and telecommunications break down and modes of delivering information and entertainment coverage (infotainment as some now say), questions surrounding access to and the use of satellites become important for all educators. Of course, I am assuming that Australia's satellites will be launched successfully next year — there hasn't been too much success launching similar satellites recently!

First I want to make a few comments about the use of the term 'revolution' in the theme for this address. Like Anthony Smith, the Director of the British Film Institute, author and commentator on communications technology, I believe the term is rather overworked. We need to devise a new metaphor to describe changes taking place around us — one which is less traumatic and more intermingling of cause and effect. To quote Smith:

> In order to reduce the bewildering hyping of technological history, we need some explanatory models of the inventing process that demonstrate the collective, though concealed social dialogue that almost invariably precedes the advent of a new device.[1]

Another term which is commonly used is 'technological change'. Again this implies a certain type of determinism which loses sight of the social and economic context.

The Satellite System

It is not my purpose in this paper to develop an explanatory model or even trace the dialogue preceding the invention of satellite technology, except to recall the popular science fiction of Arthur Clarke and the design and use of satellites in the militarisation of space. But like so many inventions, new commercial uses are found, and in Australia the introduction of a domestic satellite system can be linked directly to the interests of commercial television corporations.

It is now seven years since Mr Kerry Packer, who heads the company which owns the Nine television channels in Sydney and Melbourne, suggested to Prime Minister Fraser that satellites were an ideal way of distributing television programs Australia-wide. Packer's vision involved the major metropolitan commercial stations 'networking' their programs and advertisements via satellite to an expanded number of 'affiliate' stations in regional and remote areas for rebroadcast. All Australians would then have access to three commercial television channels, and the metropolitan stations would gain an expanded national market for advertisers.

This vision, or a variation on it, is now being translated into reality. In fact, the Government has already established an institutional and legislative framework for the satellite system. AUSSAT, the Commonwealth-owned satellite company, will

operate along commercial lines, and the satellites have been designed to suit the interests of the television industry. New legislation has been introduced to provide additional commercial television licences in regional areas of Australia, though at this stage the number of outlets per area has been limited to two rather than three — the number required if each commercial network is to have its own 'affiliate'.

However, the Packer vision presents problems for the new Labor government, problems which the previous Coalition government was unwilling to resolve. Recent developments in satellite design now allow broadcasting *directly* into people's homes, though the necessary receiving equipment remains costly. This technological advance required a policy decision will will affect the future of the industry. It could mean that the four major media corporations who dominate the three commercial television networks could gain access to the screens of everyone throughout the country. It could also make regional stations redundant. At this stage, the Government has announced that it will restrict direct broadcasting to homes in remote and isolated areas, but it has also warned that this cannot be delayed indefinitely.

I suspect that many people here have not been following these changes in any detail, partly because of the seemingly technical complexity involved in the term satellite. It is unfortunate that the issues have been obscured by the 'technical hype' and 'alphabet soups' such as DBS or SPS which are used to describe satellite services.[2] Yet the way the satellite system will distribute problems is not difficult to grasp. From a central location, probably one of the larger metropolitan television stations, signals can be sent up to the satellite in the sky and then returned down to every television station or home in Australia that has the necessary receiving equipment. All this can be done *simultaneously* without any concern for distance between stations.

The Satellite Program Services Inquiry

In late 1983, the Government referred some of the remaining problems in relation to the satellite to the Australian Broadcasting Tribunal for further inquiry. It is significant that this Inquiry into Satellite Program Services has stimulated so little public debate. It has received virtually no media coverage, and the press table at the Tribunal's headquarters in Sydney was often occupied by the lawyers and top executives from the media corporations rather than working journalists. While I don't subscribe to 'conspiracy theories' on the way the mass media operates, it is important to note that those commercial television corporations which are placed to expand their market reach via the satellite are also those who own and control most of this country's press. They also have substantial interests in radio, video, records, film and new information services which can be delivered over the television screen, such as teletext and videotext.

The electronic transformation of the media means that all types of information — text, data, images and sound — can be delivered via satellite, and most of the large media corporations which dominate the television industry are poised to recycle their product in new commercial forms. In the past, the Government has failed to address the issue of cross media ownership in any regulatory way, and the Tribunal Inquiry into satellite services was not specifically asked to investigate this problem. Hence the Inquiry was narrow in scope, addressing itself mainly to traditional notions of broadcasting — notions which are rapidly becoming redundant.

The Tribunal members nevertheless subjected the major television interests to

a detailed series of questions about their present networking arrangements and future plans. Responses indicated that if the four large media corporations which dominate the three commercial television networks are allowed to use the satellite to expand their market for advertisers nationally, and if they also use it to deliver other forms of electronic media, then their power will be virtually limitless.

The Australian Broadcasting Corporation

It is somewhat ironic that the means for this expansion will be achieved at the taxpayers' expense, since government bodies, including the two government-funded television services, will provide most of the revenue for the use of AUSSAT. The largest single user will be the Australian Broadcasting Corporation (ABC). As the Chairman of the Tribunal wittily commented while the ABC's Managing Director was explaining his plans: 'You're locked in Mr. Whitehead . . . the satellite might crash otherwise'.

The ABC is in the process of restructuring to take advantage of the satellites. It will use the most powerful section of the satellites to deliver television and radio services to the 300,000 or so people living in remote areas who have no access to any type of television other than video tapes. This new service called the Homestead and Community Broadcasting Satellite Service (HACBSS) will emanate from the major state capital stations. As part of the necessary economies involved, the ABC has announced the cessation of its two regional stations at Townsville and Rockhampton.

The ABC Managing Director also told the Tribunal of the Corporation's plans to enter into competition with the major network stations in the supply of programs to the newly-established commercial stations in regional areas. This was described as a project involving an 'American-style network of affiliates' whereby the ABC will offer previously used or especially tailored programs in an attempt to gain extra revenue.

The ABC has also proposed to the Government that it be permitted to establish a second satellite-delivered television service. This would consist of prime-time programming such as first-release movies, golden oldies, special events and maybe even some sport, but it would require payment of a special fee to see. This type of service is usually referred to as pay TV since its revenue is derived from subscribers rather than advertisers or government subsidy. In the major metropolitan areas, the ABC would provide this new service itself (possibly as part of a joint venture with private enterprise) and it would franchise it out to the newly-established regional stations so that their advertising revenue could be supplemented by subscribers' fees. The satellite would be used to streamline national delivery.

At this stage the Government is still considering whether or not to introduce pay TV, and the ABC is only one of a number of contenders hoping to take advantage of this new commercial opportunity. Profitability of the service will depend on the availability of attractive, inexpensive programming and whether the Government decides to regulate the proportion of Australian-made programming required. There is the further problem of finding programming that is different from the videocassette market which has been extraordinarily successful in Australia.

Metropolitan Commercial Television Stations

Access to mass appeal programming is the key to success in the television industry: whoever controls programming controls the key to audiences, advertising revenue and even subscription fees. Evidence to the Tribunal Inquiry indicated that the major metropolitan network stations dominate virtually all aspects of international and national program supply. It is interesting to note how access to international satellites has streamlined overseas acquisition. Over the years the three networks have developed lines of distribution with overseas corporations such as the United States networks and US distributors, and commercial companies in the United Kingdom. They pay substantial licence fees for the exclusive right to broadcast telemovies, mini-series, sport and overseas news. Recently, several of the Australian network companies have consolidated these distribution links by purchasing shareholdings in international television news corporations, attempting to buy up program material such as Warner Brothers library of films, and constructing studios on the west coast of the US. Access to international satellites now allows the delivery of this programming — often in 'real' time — twenty-four hours a day. With the introduction of the domestic satellites, network reach and power over program choice will be enormous.

The corporations which own the major network stations have also moved into the production of Australian films and television programs such as mini-series. Evidence to the Inquiry indicated that prior agreement for network distribution, presales and prepurchase agreements were now regarded as essential before production proceeds. Several of the corporations have even established subsidiaries which produce their own films and telemovies, using the generous tax deductions provided by the Government. It would require an enormous capital base to break this network stranglehold over programming. If they also extend their market reach via satellite they will control the acquisition, production, distribution and broadcasting of virtually everything Australian viewers see, read or hear on their television screens, with the exception of the ABC.

When combined with the newer opportunities opened up by changes in the electronic media and information and communications technology, questions of cross media ownership and concentration of control in the hands of four major corporations are a cause for concern. During the course of the Tribunal Inquiry a number of unions and a major public interest group indicated that before the satellites extend this control even further, there should be a major restructure of the television industry to allow for some diversification of programming sources in both information and entertainment.

Strategies for Change

The major public interest submission to the Tribunal came from Communication Action.[3] It recommended that the large media corporations, most of which own two television stations in the major metropolitan areas, should either be licensed as broadcasters for their areas (as is the case at present) or as distributors beyond their areas. By separating distribution from broadcasting, Communication Action hoped to encourage diversity in program sources and curb networking by the major stations.

While this is a novel idea, it remains untested, and the Government is in a hurry

to resolve the questions of satellite access. Aside from the launching date in the middle of 1985, there are political promises to be delivered in an election year. People in remote areas have been promised satellite-delivered television; people in regional areas have been promised more choice from satellite-delivered television; and the satellites have been designed so that their revenue is dependent on television interests, both national and commercial.

The Commonwealth Department of Communications has suggested several other less radical solutions which would either add to or slightly alter the existing television industry structure. One proposal is that the regional stations form themselves into consortia on a State-wide basis and offer commercial television to homes in remote and isolated areas. This would stop the major network stations from performing the same function, though the regional consortia would still be dependent on network programs, since revenue gained from remote area advertising would not pay for extra program production, except perhaps additional news items.

Another proposal is the introduction of a new pay TV service which could hopefully provide some competition for the network stations. At first glance this seems an ideal solution, but its profitability depends on cheap programming, most of which comes from overseas. As the Australian Film Commission and various film and television industry groups and unions have argued, most of this programming is already available in cinemas, on videocassettes or on 'free' television. In a television market the size of Australia, a new service will not necessarily produce and distribute different programs, nor is it likely to be capitalised to the extent that it can compete with the network stranglehold over programs.

The film and television producers were more interested in gaining access for innovative and experimental productions on existing outlets, particularly the ABC. In the past few years, the ABC's record in terms of purchase and production of Australian programs has been lower than that of the commercial stations, hence there was considerable doubt that the ABC's proposal for a new pay service could produce much in the way of diversity. The warning issued by the ABC Chairman Richard Boyer to the Royal Commission into Television in 1954 is worth recalling in the present situation. He argued that:

> The hours of telecasting and number of stations operating should be strictly related to the availability of material of good quality. As with radio, it is possible to put programs of a sort at small cost on the TV screen. The interests both of the public and of the prestige of TV, require limitation of hours to a point where standards can be maintained.[4]

Cultural Implications

Questions of quality and cultural diversity have been submerged in the economic and technological imperatives of the new satellite system. During the Tribunal Inquiry there was mention of the importance of local programming with the advent of national networking, and considerable concern over the impact of an Anglo-American diet of television and advertisements on remote Aboriginal communities, but there was minimal discussion on issues such as the quality of information and entertainment or of cultural diversity.

In fact discussions of the cultural implications of certain types of television programming are difficult to find in the history of Australian television. Early critics, most of whom were trained in University literature departments, made 'aesthetic

judgements dressed up as social metaphors' about the 'high culture' material shown on the ABC.[5] Mass appeal programming was not regarded as worthy of discussion, and was dismissed with the rather circular argument that the 'public get what it wants'. Recently the issue of mass culture has resurfaced in the proposition that much of mass appeal programming presents elements of Australian working-class culture in various forms.[6] An example might be the popular series *A Country Practice* which features issues such as youth unemployment or repetition strain injury among migrant workers.

The lack of any theory which guides analysis and criticism of programming means that the way images, sound and text on the television screen shape our consciousness and define our imagination, feelings and perception of events, remains largely unkown. What is clear is that the simplistic type of argument that violence on the screen produces violent behaviour is false. Recent theoretical work has turned to analysing the relationship between the audience and the mass media industry, media technologies and the message/text using insights from diverse disciplines such as semiotics and psychoanalysis. The language of this approach is still unclear, and more work needs to be done on the 'relation of audiences to power and control within the system'.[7]

Until there is some accessible way of analysing and criticising visual media, it remains difficult to formulate arguments about the cultural meaning of mass production and national networking. The Royal Commission on Television in 1954 was overly optimistic when it concluded: 'If the public put up with inferior TV it will only have itself to blame . . . what is needed is a vocal public which will offer constructive criticism and refuse to be satisfied with programs'.[8]

The recent Tribunal Inquiry showed very clearly that, at this stage at least, there is no such phenomenon as a 'vocal public' or even 'vocal publics' on any scale.

Future Implications

It can be argued that a medium such as television actually limits communication and reduces 'feedback' to the lowest point compatible with the system in which it operates. At present, this system is dominated by four large media corporations centred in Sydney and Melbourne, and this centralisation of production will allow the satellite system to increase the homogeneity of information and entertainment delivered to even larger audiences. This tendency can already be identified through the use of international satellite links to the US, where programming is readily available without respect to national boundaries or cultural identity. On the grounds that use of a limited public resource such as the radio spectrum is finite, television licences have been allocated to the select few who can afford to pay. New ways of using this spectrum combined with developments such as broadband cable could provide opportunities for others to access the means of distribution in the future. However, at this stage, access to the expensive, publicly-owned satellite system is not likely to produce any diversity in the production and distribution of information without Government intervention to restructure the industry.

In the thirties Bertold Brecht used to dream about radio as a communication medium which would permit everyone to listen and talk to everyone else. His thoughts have been developed by the essayist Hans Magnus Enzensberger in an essay titled *Constituents of a Theory of the Media*. Enzensberger argues that to transform

the means of distribution into a means of communication is often technically possible, but is prevented for political reasons. He likens the technical division between transmitter and receiver to the social division between producer and consumer.[9]

In terms of shaping our consciousness and activity, these divisions are particularly important. We are more accustomed to receiving and consuming television images than to transmitting and producing them. Recent developments in the technology of production and consumption are transforming this situation. Small and relatively inexpensive sound and video recorders and computers permit a wider range of people to participate in the production of information and entertainment.

Meanwhile the television screen is being transformed into a multipurpose receiver which has the capacity to slice up the household into individual microconsumers. Developments such as videocassettes, computer programs, teletext, videotext, stereo sound and high definition television will all provide the individual with more 'choice'. But as Anthony Smith has said:

> Choice is the chimera of the age . . . it provides the opportunity to perfect the 'self' as the basic method of consumption.[10]

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SOME ASPECTS OF THE COMMUNICATIONS REVOLUTION

REIN MERE

Introduction

This paper explores some of the aspects of the communications revolution. As we are often told, the brave new world is upon us. Perhaps 1984 has not presented us with all the horrors of the Orwellian vision, but changes are occurring and few of us can remain untouched. Yet is it a revolution? Change has always been with us and society is constantly adapting. Is there really anything different about the situation today or is the 'communications revolution' another catchy journalistic invention?

Developments in Communication

There is no doubt that there have been significant changes in our ability to communicate — indeed the current era of communications is only 100 years old. In that time we have seen the slow, single-channel point-to-point telegraph service give way to satellite communications able to provide world-wide coverage with thousands of telephone channels. We can also bring live television events from one side of the world to the other or permit a huge world community to watch a specific event; for example, the Olympic Games. Marshal McLuhan's global village is a reality in 1984.

While the vastly increased capability to communicate is an exciting development, it is not the stuff which stirs revolutions. If we analyse the nature of communications traffic, however, the picture begins to emerge. While voice communications remains predominant, a rapidly increasing component of communications traffic is "data" — a high speed digital bit stream spanning nations, cities and continents. If we translate "data", that colorless, all-embracing noun of the computer specialist, we find that what we are really talking about is the ability to move large amounts of information at high speed. And our new, efficient technologies will move, equally effectively and without discrimination, general information on tomorrow's weather as well as highly sensitive and personal information.

If we add to this picture the ability to automatically store large amounts of information in such a way that it can be sorted, sifted and searched at high speed to extract particular information, and the information so obtained can be checked, compared or correlated with information held in another store — possibly in another country — we begin to see the stirring of a revolution.

Such developments have created general concern about the protection of information held in stores to ensure that only those authorised are able to have access to the information. It is not only the private or personal nature of the information, however, on which attention is focused. Information, particularly timely information, has acquired intrinsic economic value. Trade in information is growing rapidly and it has become an economic and strategic concern of countries to control the transfer of information across national boundaries. An international regime has been established to put some order into this traffic, called "trans-border data flows".

Yet others have very different concerns. They see the facility to participate in the transfer and sharing of information biased in favor of the developed, affluent countries while developing countries struggle to create even rudimentary communications networks. They see the new technologies and services merely creating a chasm between the 'information rich' and the 'information poor'. For example, the Secretary General of the International Telecommunication Union, has noted that in 1980 there were 465 million telephones in the world, of which less than 10 per cent were in 85 per cent of the nations.

It is perhaps instructive to look at why it is only now that such considerations have become issues. The answer, of course, lies in the explosion of new technologies, made possible by a time of relative peace and stability in the world and the growing affluence of the developed nations. For example, the space program of the United States, fuelled by the vision of placing a man on the moon, has produced, in addition to the so-called space sciences, many advances in computer technology, precision engineering and complex management systems.

The understanding of many of the new technologies has passed from the educated lay person to the specialist, adding much to the mystique — even trepidation — of innovative new processes, services and systems. At the centre of these developments is the silicon chip — an integrated microcircuit able to perform at low cost a bewildering range of information management and computation functions. While this might not be a violent revolution in the textbook tradition, it is undeniable that much is happening at great pace to shake our established structures and perceptions.

Thus not only can we now store huge amounts of information in very compact form but we can also perform at very high speed a range of sort and computation functions not possible even ten years ago. The small and inexpensive desk-top microcomputer today has more computing power than the huge and expensive computers of the 1960s which filled several rooms with equipment and required large air conditioning units to dissipate the heat. In other words, computing power has passed from the large corporation or government institution to the individual.

What makes these developments even more powerful is the advances in communications technologies. Once considered separate disciplines, there has been a progressive marriage of computers and telecommunications. Microprocessors have made possible new communications techniques which have linked computer to computer, operator to several computers, and computers to different information stores. As modern telephone exchanges are computer controlled, the delineation between computers and communication is becoming increasingly blurred.

It is precisely this cheap and powerful computing power coupled to very efficient and readily available communications channels that lies at the heart of the communications revolution. Not so long ago huge amounts of paper were moved around the country and special arrangements were required to store the tonnes of paper and files. Now we can leave information exchange to computer-computer transfers, or between communicating word processors.

New Technologies

Let us look at some of the new technologies that are driving this revolution.

Communications satellite

The one which has received much publicity is, of course, the communications satellite. It is often hard to realise that satellite communications are less than 20 years old. Most of us remember the launch of Sputnik in 1957 as we watched with awe the small bright star move quickly across the night sky. It was not until 1965, however, that the first international communications satellite, 'Early Bird', was launched. Australia will be launching its own domestic satellite system in 1985 — just 20 years later.

The communications satellite operates very much like a communications repeater in the sky. From the high ground of the geostationary orbit, the satellite can transmit and receive signals from distant transmitters unrestricted by the curvature of the earth. A satellite is able to handle at the same time huge volumes of data, several TV signals, and thousands of telephone conversations — a feat that could not be accomplished with transocean cables that have provided the principal international communication links for many years.

However, optical fibre transocean cables are being planned which will have greatly enhanced capacity over traditional copper cables. It will not be too long before we see the three technologies working side by side each utilised for its most cost-effective capabilities.

Videotex Service

Another innovation is the videotex service. In its most basic form, a small terminal can provide access via a telephone line to a data base or a number of data bases compatible with the standards of the terminal. The required information is displayed on a television screen. The system is interactive in that the operator can conduct transactions with the data base by means of a small keyboard and simple instructions displayed on the screen.

The system is designed for people who have no previous experience with computers. With only a few minutes of instruction, an untrained operator can gain access to the data available and transact a variety of business from home. Transactions such as banking, shopping, making reservations at a restaurant or theatre, or simply playing games, are all possible with this technology.

A variety of videotex services are becoming available around the world. Public access systems tend to cater for the services noted above and also provide information on common interest items such as real estate prices, airline timetables, weather and the like. Telecom is in the process of establishing a public access videotex system. Specialised videotex systems serving particular groups of users have been more popular and a number of private systems have been established. For example, in Australia General Motors-Holden has established a stock control system which allows dealers to identify where a particular car is held, or at what stage and where it is in manufacture.

Transmission systems

Transmission systems employing optical fibres have the potential to revolutionise communications which, unlike the satellite or radio, utilise a physical link between users. Glass fibres not much thicker than a human hair transmit pulses of light

and can carry far more information than copper wires or coaxial cable. In time, optical fibre networks will reduce the cost of 'wired' communications systems and because of their greatly increased information-carrying capacity lead to a reduction in the cost of information transfer.

Terminals

A by-product of these developments is the terminal explosion. We are all familiar with the three or four telephones on a desk before telephones got 'smart'. In the same way, one requires a special terminal to access the personal computer, another terminal to access international data bases, a different terminal for videotex, yet another for gaining access to the central mainframe computer and, of course, the word processor is a separate system too. Fortunately the technology of the communications revolution is coming to our aid here and equipment is already available which allows computers of different standards to 'talk' to one another and makes a single terminal much more versatile. But there is a long way to go.

Part of the problem is the nature of our fixed communications links. The telephone network has grown progressively over many years, with the primary objective of transmitting voice traffic and modest amounts of slow speed data. To accommodate the new services being created almost daily, more and more information must be moved at increasingly faster rates. Not only is this necessary to permit several services to 'share' available circuits but also to carry the high speed signals being interchanged by, say, a host computer carrying a data base and the operator's terminal.

In general, the simpler a terminal or service appears to be to operate (that is, 'user friendly') the more translation must be transacted between the terminal and the computer. Telecom is continually upgrading its lines and exchanges to meet the changing needs, but when one takes into account the size of the network — an investment of $11,000 million — this program will take time.

As optical fibre links are incorporated and digital exchanges established, the network will be able to cope with all new types of services. Intelligence will be added to the network — active computer capacity which will convert the signals of one system to those compatible with another dissimilar system which is being accessed. Thus not only will the network provide a high speed electronic highway for the new services but it will allow a range of different services to be accessed from one terminal. This concept is called the Integrated Services Digital Network, for which international standards are now being determined.

Research and Development

It should be emphasised that these advances are predominantly based on imported technology. There is some Australian involvement in developing new communications equipment and much of the equipment used by Telecom is manufactured locally, but like many countries Australia tends to shop from the world market. The obvious attraction is that the procurement of tried and proven designs is one way of ensuring that we have a modern, reliable communications network at the lowest cost and risk.

The plain facts are that the cost of research and development of new telecommunications systems and equipment is rising rapidly and the risks of getting a product onto the market for long enough to recover development costs are high. Technology

is changing rapidly and innovations are appearing on the market all the time. With large overseas corporations or conglomerates developing new technologies and applications, Australian technology has to be both excellent in concept and attuned to international needs if it is to have any chance of acceptance.

Choosing among New Technologies

The choice of a particular technology to provide a range of services is a significant process. Should the purchasing organisation have an incomplete perspective of the needs of users, the equipment may not meet the complete range of user requirements. Indeed, some services seen as essential by particular sectors may not be able to be accommodated. Thus it is in the interests of all potential users of communications services to convey their perceived needs to the organisations which operate our communications networks — Telecom, the Overseas Telecommunications Commission (OTC) and AUSSAT.

The defining of needs, however, is not always easy as some systems knowledge is required. For example, information now available from data bases through systems such as MIDAS, CSIRONET, AUSINET and DIALOG allow subscribers to do extensive literature searches. To get to the information, however, the user must come to grips with the way the system works. Extracting information from some data bases can at times require a degree of dedication, cunning and intuitive insight that Machiavelli would have admired. Without the necessary understanding of the peculiarities of these systems their true potential can be grossly underutilised.

Products of the information age are all around us. Automatic teller machines require a considerable degree of interaction between person and machine. France will shortly be the first country to do away with the telephone book although it will be available, on request. Its MINITEL service will place a small screen and associated keyboard on every telephone subscriber's desk which will allow, through simple search procedures, the desired telephone number to be found. The same terminal will be able to be used as a videotex terminal to access a range of information services.

Technological advance does not mean that we need be trapped in a web of technological determinism. The rate and nature of change can be within the community's control if it is willing to influence the use made of these developments. Without adopting a Luddite mentality, the community should nevertheless not passively accept all of these advances without examining the pros and cons of their introduction. Educators can assist this process by ensuring that an awareness of these developments is part of school curricula and that students are also aware that in our democratic system they can — some would say should — influence decisions that affect their lives.

Telecom, OTC and AUSSAT are Australia's communications carriers. Their operations, activities and decisions will govern the speed and extent of new communications developments as they affect Australia. These agencies are in a powerful position to determine the type of technology introduced by the enforcement of standards for equipment operated with their systems. Accordingly, they can strongly influence whether a particular technology is used in Australia or not. Such important decisions are easier to make if the users declare their needs or concerns

at an early stage.

These agencies are not entirely free in their actions. Not only do they operate under specific legislation, but because of the international nature of telecommunications traffic, a telex machine in Sydney, for example, must be compatible with one in Djibouti if the message is to be successfully transmitted between the two machines. The necessary international co-operation on technical standards is achieved through the oldest international organisation in existence — the International Telecommunication Union (ITU). Australia plays a significant role in ITU and has considerable influence in its activities. An Australian, Richard Butler, is the current Secretary-General and is the first Australian to be elected to head a large United Nations agency.

Implications for Education

The communications revolution offers several possibilities in the field of education. Given the size of Australia and its population distribution, the potential for interactive learning at a distance would seem to be attractive. For example, we are already seeing the establishment of video teleconferencing facilities for business organisations. While the price of the equipment and access costs are high at present, we can expect to see a steady reduction.

The AUSSAT satellites will probably be a big factor in decreasing the hourly costs of this service where distant links are required. The satellite also has the facility to distribute educational material throughout Australia, perhaps in off-peak periods for automatic recording. There is also the option of providing one-way video from teaching centre to student, and relying upon less costly return communications by telephone or radio link. It is interesting to note that with the satellite there need be no particular emphasis given to establishing centres of learning and excellence in metropolitan areas — equal access could be provided from even remote locations.

The communications revolution brings with it social obligations. As educators, you need to look closely at your curricula. There are many ways that the enhanced ability to communicate and the implications of that facility can be reflected in courses of study. For instance broadcasting in Australia is a pervasive force, substantially influencing our perception of the world around us. Issues of media ownership, the 'right' to broadcast peoples' views, and the structure of communications systems and services could also be given more attention.

It is pleasing to note that many schools are trying to ensure that students have a general appreciation of the capabilities of computers and associated communications links. Computers in education, however, does not mean simply placing a microcomputer in every classroom and teaching students how to program the machine. The computer is a powerful tool which needs to be integrated in an imaginative way into teaching procedures and curricula. The term 'computer aided education' is more descriptive, as the emphasis must remain on the task in hand — education.

But before we can have computer-literate students we must have teachers who have mastered the communications revolution and can pass on the mysteries of the new tomorrow. With rapid changes in technology, this presents a challenge to us all.

It should not be overlooked that despite the complexities of the new technologies it is still the educators who are in the best position to determine how to take advantage of the products of the communications revolution for education purposes. Technologists can help to explain what services are practicable with particular technologies and what are the attendant costs, but the responsibility for planning how the new technology can be harnessed for education rests squarely with the education community. Unless educators grasp the nettle and dare to dream, tomorrow's generations will be equipped with yesterday's concepts and technologies.

The coming of AUSSAT gives educators an opportunity to exploit new technology to the full. It will allow educators for the first time to take a national approach to education matters despite the institutional rigidities that face change in the traditional State-by-State approach. School of the Air services can benefit from intelligent use of the satellite and the Queensland Education Department has announced that it will undertake satellite trials for the Mount Isa School of the Air in January 1986. Unfortunately, I know of no other proposals to use the satellite for education purposes, despite the fact that the launch date is a year away.

To effectively utilise the new technologies for educational purposes educators will need to begin co-ordinated planning now. There are long lead times associated with equipment procurement and introduction and, of course, a lot of effort must be put into curriculum development to extract the maximum utility from these technological advances. In view of the potential benefits to be gained, it is not an acceptable option for educators to remain agnostic in the information age.

Conclusion

In summing up, we can indeed influence the course of the communications revolution. By educating students in the principal considerations, both technical and social, we will be equipping a whole generation for not just survival in the communications era, but giving them the skills to enjoy the benefits that can be obtained. Perhaps most importantly, we will be giving them the awareness and confidence to ride and guide the whirlwind of change.

To be credible in these endeavours, it is vital that our educational institutions are themselves active users of the products of the communications revolution. And, of course, there are institutional and organisational changes to be addressed and set in train. But technology is there to be used intelligently and choices must be made. Consequently, educators must carefully consider which elements of the communications revolution are the most effective tools for improving the quality of our education systems. It is not something to be feared or set aside but an opportunity to be fully exploited.

Charting a course in such turbulent waters will not be easy but the challenge is worthwhile. The words of Machiavelli's *The Prince* dating from 1513 may guide us in these endeavors:

> It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institution and merely lukewarm defenders in those who would gain by the new ones.

THEME 3:

BEING HUMAN IN A TECHNOLOGICAL AGE

A Social Response
Dorothy Green

An Educational Response
Davis McCaughey

BEING HUMAN IN A TECHNOLOGICAL AGE: A SOCIAL RESPONSE

DOROTHY GREEN

Introduction

It is very kind of the members of the Australian College of Education, through its officers, to invite me to share part of your discussions about a difficult and complex subject. I am conscious of my amateur status in such a professional gathering, but perhaps my very ignorance of educational theory may be a useful irritant and provoke fruitful responses. Not that my subject is education. That is for later. But nothing is really irrelevant to those who have to do with educational policy.

I find it very cheering to reflect that the College is celebrating its Jubilee by pausing to meditate on the human aspects of the new technology which is overtaking society before it is ready to deal with it. It is a thousand pities that a body with wisdom, experience and influence was not consulted long ago by business and government, and I hope you will be able to bring this collective influence to bear in the future before the sheer pace of technological change overwhelms us altogether. I wish I had more confidence in the statement of the Minister, the Hon. Barry Jones, that intellect, imagination plus technology equals progress. I wish I also had more confidence in his statement that the choice is up to us. I can see no evidence that the people at large were ever consulted about some of the most far-ranging technological innovations of our times, the introduction of nuclear power, for example, to mention only the most revolutionary. Certainly, authors were never consulted about the new mechanical devices for printing books, and the consequence is that they have to put up with longer delays in publication and a greater crop of misprints than ever before. When Henry Handel Richardson sent the manuscript of her last novel to Heinemann's in November 1938, she received the first proofs back in three weeks, and the novel was out in 1939. With the new technical wizardry now available it can take anything up to six years to publish a book.

In the political arena, the main use of television seems to have been to make it easier for political candidates in the grip of fantasies to act them out in real life, with a walk-on cast of millions. It is difficult to feel enthusiastic about the promises of instant communication at any hour of the day or night, which includes sight, sound and feeling, if we have as little to communicate as some of the sports stars interviewed by TV. reporters. I wish some of this technology could be used to prevent the structure of the English language from being destroyed by functional illiterates in the mass media, but I see little hope of that.

Remaining Human in a Technological Age

But to come to our immediate problem — of remaining human in a technological age. Perhaps we need not be too pessimistic about that while women continue to be largely excluded from the decision-making process. This exclusion results in making them angry, and as long as they are angry, their behaviour is still unpredictable. Once they are included in the power-structures they tend to become just like most of the other politicians or bureaucrats who surround them, uttering sentiments for which they have been pre-programmed. When I contemplate the political scenes around the world, I am tempted to think that the last human

characteristic left to us before long will be the capacity for disobedience, for misbehaviour. I do not know whether it is possible to program a computer to be disobedient, in order to sharpen the wits of the programmers, or the wits of its fellow computers. But it may in the end be necessary if the human intellect is to survive.

This is not a frivolous observation, for what disobedience means is the freedom to criticise, to challenge, *to choose*. It means that men and women shall be subjects and not objects, that they should have personal liberties, compatible with the liberties of others, able to discuss what they shall do with their own labour and their own energies, for ends they themselves decide upon, in short, that they should be human beings and not things. This is not to deny the interwovenness of the individual and the social. But to set the needs of others before one's own should be, not a mechanical, but a conscious choice, if we are to remain human. Without the conscious choices I have mentioned people are only on the way to being human, they are still partly things. Even to conceive of such choices is possible only when a certain level of civilisation has been reached, when men and women can be confident of having access to water to drink, food to eat, and shelter from the weather. There is something bizarre about our sitting here in comfort, discussing how we shall remain human in a society of unimaginable technological sophistication, when many millions of men, women and children lack the bare necessities for being human: they have no clean water, little food and little shelter, hardly even the level of comfort enjoyed by animals in Australia. How can we devise ever more luxuries for ourselves, while we are faced with the fact that in the last few years, certain African nations have lost 20 per cent of their capacity to feed themselves? Before we turn our attention to the problems faced by fortunate members of western-type societies in a technological age, we should have an answer to the question why it is that in an age when it is for the first time technologically possible to bring all human beings to the first level of real humanity, we seem to have lost the will to do so. We cannot be fully human if there is such a grave imbalance between our social being and our individual being. The most conspicuous result of our over-concentration on the defence of our own comfortable way of life is the obscene arms race. I have no need to draw the attention of such an audience as this to such a phenomenon.

An Historical View

To consider the problem of being human in the face of technological change is no new thing. One of the first attempts to grapple with it was made by the poet Robert Southey in 1828, just as the industrial revolution was getting into its first stride. Southey's effort (in his book *Colloquies*) was ridiculed by the historian Macaulay, who wrote:

> Mr Southey has found out a way, he tells us, in which the effects of manufactures and agricultures may be compared. And what is this way? To stand on a hill, to look at a cottage and a factory and to see which is the prettier?

Southey's voice would have been drowned out without Macaulay's assistance. The mid-19th century union of trade, economic theory and science accidentally combined to persuade European society that what their spokespersons called progress had nothing to do with beauty, or anything else that could not be measured. This utilitarian view of progress prevailed until it reached its logical outcome in the first

world war. But the sobering effect turned out to be only a temporary obstacle, and though the men and women whose lives had been dislocated by the war had their doubts about the quality of the civilisation they had fought to preserve, the 19th century view of progress soon prevailed once more, more persuasively than ever. It is still with us today. In 1924, however, there was one strong dissenting voice from the ranks of science itself: that of the mathematician A.N. Whitehead, who, incidentally, is one of the few writers on education worth taking seriously. His classic work in the philosophy of science *Science and the Modern World* has hardly yet been surpassed in wisdom especially its last chapter.

But from our position sixty years later it is difficult to see any evidence that Whitehead's wisdom influenced the course science and technology were to take. And that fact alone should give us pause.

Perhaps I might digress here to explain that by this time the terms 'science' and 'technology' were almost interchangeable. Technology in fact must always have preceded pure science. There had to be public baths before Archimedes could formulate his hydrostatic theories. And in our day it is even more difficult to separate the pure scientist from the engineer. Their relationship is symbiotic.

In his *Science and the Modern World*, Whitehead was certainly aware of their close association. He deplored the technological revolution which in the previous century had resulted in the evolution of a competitive business morality. This, he said:

> was in some respects curiously high; but entirely devoid of consideration for human life. To God's question, men gave the answer of Cain: 'Am I my brother's keeper?' And they incurred Cain's guilt. The internal history of England during the last half-century has been an endeavour slowly to undo the evils wrought in the first stage of the new epoch. It may be that civilisation will never recover from the bad climate which enveloped the introduction of machinery.

Whitehead distinguished four major contributions to this bad climate:

1. The aesthetic errors of Protestantism.
2. The result of scientific materialism.
3. The natural greed of humanity.
4. The abstractions of political economy.

It seems to me that the legacy of these four still lies heavily upon us. Whitehead singled out for particular condemnation the scientific creed that 'matter in motion (i.e. physics) is the one concrete reality in nature' and that any other considerations like the need for beauty, for love, for values, were accidental or irrelevant. It is hardly necessary to point out that matter in motion is still the dominant interest of science and technology today, and value-free science the admired norm. The supremacy of physics has led to the world which lives under the balance of terror.

Forty years after Whitehead, in 1964, after a second world war to defend what was left of civilisation, a war in which civilised values were finally thrown overboard, there appeared a sequel to Whitehead's book. This was *Science: the Glorious Entertainment* by the great American historian of ideas, Jacques Barzun. By this time, partly as a result of the moral collapse of the scientific community concerned with the atomic bomb, the attitude to science-technology, the amalgam which Barzun

called *Techne*, was decidedly ambivalent. It was an attitude of irrational disgust at one pole and of mindless credulity at the other. Barzun argued that there were not two cultures as C.P. Snow believed, but one scientific culture, which was itself split in two. On the one hand there were the scientists more consumed than ever with the strange ambition to prove that the human person was 'nothing but' a machine, like everything else, and on the other the life scientists who clung to the idea that being human had a special significance. Many artists, bemused by 'science', climbed on the band-wagon of the mechanists: architects designed 'machines for living' instead of houses; there were successive waves of cubism and abstractionism in painting, and electronic music became the rage. By 1984, the genetic engineers have got into the act. Under the guise of concern for childless members of the middle-class in a grossly overpopulated world, *in vitro* fertilisation has become fashionable and the male ambition to take over child-birth has been given a new impetus.

Barzun, in 1964, was able to point out, as Whitehead could not have done, the consequences of the unholy alliance that the Manhattan Project had brought about: the alliance of trade, technology and politics which has conditioned our consciousness ever since. His book sounds a warning against any false hopes that the humanities can stem the tide of mechanisation. They themselves have pursued the ambition to be 'scientific'. The passion for research for the sake of research (instead of for good teaching), which originated in scientific method, has now afflicted all disciplines, including the humanities, with an endless appetite for accumulating facts. Fact-finding too often replaces reflection even in the domain of literature. One might instance the lecturer in Australian literature who used a computer to discover that the poet Shaw Neilson mentioned the color 'green' more often than any other color. This fact could have been established by reading Neilson's poems in an armchair in front of the fire. The significance of the fact was hardly a matter for the computer to reflect on. Barry Jones's warning that Australia is a passive information society was long overdue, especially in the Ph.D. industry.

One might also note that even if the humanities had not already succumbed to the temptation to become 'scientific' there is still no guarantee that they would have a good effect on human behaviour. There is no proof that the study of the humanities makes people humane, that a taste for Mozart will prevent a sadist from committing acts of cruelty. And while we are on the subject of Mozart, I should like to question the assumption behind Barry Jones's view that technology will set us free to produce more Mozarts or Shakespeares, et al. There seems to be no correlation at all between artistic genius and 'high' technology, though there may be one between artistic genius and craft. Bach wrote all his great cantatas and masses with a quill pen by candlelight. Moreover the notion that intellectual 'creativity' is superior to or more necessary than other kinds of creativity needs to be examined. It is a value judgement that has been put abroad largely by men and acquiesced in by society in general. But the members of society need to be fed and loved and cherished just as much as they need the ceiling of the Sistine Chapel, perhaps even more. And it is just as 'creative' to fulfil these needs as it is to formulate the equation E = mc squared. Perhaps a ban on the word 'creativity' would be a good idea. It has been so debauched by advertising as to have lost all meaning.

Implications for the Future

In the twenty years which have elapsed since the publication of Barzun's great

book we have become more capable of appreciating his definition of Science as 'the glorious *entertainment*'. And, I should add, more capable of detecting the sinister implications of the definition.

To begin with, we can now make out a better case for Barzun's view that the kinds of minds attracted to the life of science are those which are more interested in things than in people. The scientist's preference for 'objectivity', which, for no logical reason is regarded as superior to 'subjectivity' too often conceals a deeply hidden distaste for the human. The scientist, as Barzun points out, has a burning ambition to become nothing but a 'seeing eye' intent on examining a small, carefully selected area of experience from which all trace of the human has been erased. He can usually be counted on to sneer at women for introducing a personal element into an argument or to dismiss their point of view as emotional. It is hard to make him see that thinking itself is an emotional activity, directed to the attainment of certain goals and that reason is not the contradictory of emotion, but simply a method of attaining the goals.

When the scientists' dislike of the living, breathing human is accompanied by a strong instinct to play, a characteristic of the young child, we are in for trouble. This combination is most obvious to women who can still endure watching television news, or 'World at War' or similar programs, which exhibit the consequences of prolonging the play instinct for cops and robbers into adult life. The laboratory and the battlefield are exhilarating playrooms.

Yet it is no disparagement of science to call it the 'glorious entertainment'. Barzun reminds us that science is one of the finest achievements of the human mind in free play. But it is unsafe to ignore the fact that science, the outcome of the young child's inquisitive impulse to push things around to see what will happen, is prepared to take tremendous risks with human life, and indeed all life on earth, while insisting that its activities are morally neutral. One obvious example of this attitude is the irresponsible behaviour of many of the scientists engaged on the Manhattan Project. They were not we are told, completely sure that their test explosion at Alamogordo would not blow up the hemisphere. I have yet to meet a woman in her right mind, who would give her children food out of a tin, if she was not absolutely sure that it was unpunctured. Robert Oppenheimer's naive delight in projects that were 'technically sweet' has its echo today in President Reagan's recently announced commitment to his 'star-wars' project, a project in which it appears Australian science is already involved. This decision makes it clear that these games are now indulged in on a scale which bids fair to impoverish the whole globe, not for any benefit they will bring to mankind, but for their own sake, because, as one infatuated nuclear scientist admitted some time ago, 'it is fun to make new weapons'. This is technology out of its wits.

In order to pay for all these war-games, the United States would have had to invent the Soviet Union if it had not already existed.

But even if the risks of blowing ourselves up were to be eliminated from human society, this would not guarantee that peaceful technology would not threaten our humaneness, our essential selves. Barry Jones rightly stressed the need for intellect and imagination in shaping our future. But I am afraid he did so without reference to our historical situation. I raised this question from the floor earlier and should

like to return to it. I draw your attention to the words of a great living historian, E.P. Thompson, who rejected the idea that the Luddites were mindless machine-wreckers. He pointed out that 'behind every such form of popular direct action some legitimising notion of right is to be found'. He went on to say that 'the eighteenth century saw the last desperate effort by the people to reimpose the older moral economy as against the economy of the free market'.

The idea that there ever was such a thing as a moral economy, even in theory, would be incomprehensible to many of our legislators. And it would be hard to prove that there was proportionately less greed in medieval society than there is today. But what we can say is that there were *laws*, even in the time of Elizabeth I, against 'engrossers', that is against those who bought up supplies to force up prices. The notion that pre-nineteenth century economy was basically a moral economy is no more a fiction than the present belief that multinational corporations are operating in a free market system. The Luddites, incidentally, were not mainly composed of lace-makers, i.e. members of a 'luxury' trade. They were first of all croppers in the cloth industry, and later stockingers, of whom the lace-makers were a section. Their struggles to retain a human element in the face of a dehumanising technology was put down by a government fearful of the French Revolution and then of Bonaparte. The insult 'Bonapartist' was flung around to discredit reformers, as indiscriminately as the word 'communist' is flung around today. Like these forbears, the people today are faced with keeping control of technology in an economy whose only principle is profit. We have had two hundred years to get used to this principle; to the Luddites it was new and shocking.

The Aim of Governments

The aim of governments, then, as now, is to control. What governments now have to face is the difficulty of controlling the hugely growing masses of redundant workers and soldiers for whom they have no longer much use. So that technology will either consciously or unconsciously be directed towards retaining control and if it can be employed to internalise acquiescence that will be even more satisfactory. The typical Australian attitude to those who have legitimate grievances: 'Don't rock the boat' is ideal preparation for the internalising of control. Among the ways of controlling are the techniques of eighteenth century spy systems and of 'combination' laws. The tendency of many recent technological inventions is to isolate people in their homes. The fact that so many ordinary people still have the good sense to turn up at football and cricket matches is evidence of their commonsense: at least one section of the population still believes that direct experience is preferable to television. Music, the theatre and cinema are already suffering from the impact of electronic recordings, TV drama and video-cassettes. The idea of communal enjoyment is receding. This would matter little, if there were any sign that domestic hospitality were regaining the purposefulness that it once had before the invention of the gramophone, when families and their guests made their own music, or listened to readings and recitations and discussed them. Too few of our domestic social occasions provide opportunities for anything other than over-consumption of food and wine and desultory conversation. The drift towards isolation is perceptible now not only in the entertainment area but also in the work area. Daily intercourse with a variety of people is now being cut off by the introduction of automation in supermarkets (inventions which have already turned housewives into packhorses),

in banks, and finally by its introduction into the home itself. You needn't go to the office any more. You can turn your home into an office, indeed into two offices, if both partners work.

None of this would matter much, if there were any evidence that sophisticated technology had ever been used wisely. But its past record is not encouraging. Freedom to drive individual cars has cost Australia more lives than were lost in two world wars and a huge number of incapacitated people who are permanent charges on the State. Nuclear power stations are the most complicated and expensive systems known to humankind for boiling a kettle of water. Their main use I need hardly comment on. Nuclear medicine is probably benign, but it is open to question whether its therapeutic usefulness will in the long run be greater than if the money spent on it had been spent on social and preventive medicine.

Behind every invention which serves to isolate people from one another or to centralise their energy source lies the desire for power, for control. The real objection to nuclear energy, for example, is the one which is least often mentioned: the fact that to keep it as safe as it is claimed to be by its proponents, will require what can only be called a police state, the very opposite of that democracy we are always being urged to preserve.

Those who now look back on the first phase of the industrial revolution with dismay often justify its atrocities, its regimentation of workers, by pointing out that it raised the general standard of living. If this were true, and it is at best a partial truth, we must ask ourselves whether we are justified in trading off the sufferings of one generation against the gains of a future generation. The agony of the people who went to the wall in the late eighteenth and the nineteenth century is not assuaged by such thinking and the retrospective comfort we offer them is really directed to our own consciences. But there is a more immediate charge we cannot escape: that the Western world has now exported the atrocities it once committed on its own people. Whereas the prosperity of the Victorian factory owner once depended on the slave labor of the children of his own countrymen and women, a good deal of our present prosperity depends on the exploitation of cheap labor overseas. And part of this slave labor is the labor of children — in South America and India and elsewhere. Only the other day, the Indian government acknowledged the existence of such labor and condoned it by saying it was an economic necessity.

The problem of who or what shall supply the labor, or energy to meet human needs is an ancient one. It was Aristotle who pointed out more than two hundred years ago that if shuttles and zithers moved by themselves there would be no need of slaves. He did not pause to ask what would happen to the slaves made redundant by automating manufactures and music. Nor did he ask an equally important question: What would happen to their masters?

The vagueness, the rosy optimism, which justify each step towards releasing us from manual labor as further progress in the cultivation of the spirit, has little evidence to support it.

We have of course abundant evidence from thousands of years of history testifying to the dreadful struggle the human spirit engaged in to lift and maintain itself above the unremitting demands of the body, above the tyranny of the seasons. But we

have not paused to reflect on what might happen to the spirit if that struggle were suddenly to cease and all the demands of the human body were to be satisfied without effort. To ask this question is to open up for examination all our previous assumptions about what is work and what is not. Why is the loss of paid work for men 'catastrophic'? Women have been doing unpaid work for centuries without anyone agonising over the fact. Were they merely filling in their leisure time?

Some of the effects of enforced leisure on redundant members of society are already apparent and many of these are not very edifying; but could it be that these effects are the result of being brought about in the absence of a moral economy? Suppose for the sake of argument our present economic injustices could be resolved and the benefits of 'abundance' became available to all. Would such an arrangement necessarily result in a refinement of spirit? The most penetrating and disturbing examination of such an idea was written before 1914 by the novelist E.M. Forster. This is the third book I should like to recommend as compulsory reading for politicians and educators. I have always regarding Forster's short story 'The Machine Stops' (in the collection *The Eternal Moment*) as the most credible prophecy of what would be the fate of the human race if it did not destroy itself in war. I read it again in the light of Mike Cooley's monograph *Architect or Bee?* and was surprised to find the following opening sentence, linking them together: 'Imagine, if you can, a small room, hexagonal in shape, like the cell of a bee . . .'

I don't want to spoil the story by discussing it here, for I earnestly hope that you will read every word of it. But there is one passage I cannot help mentioning, because it happened to a friend of mine not long ago. This is the passage where the mother, who is the central figure of the story, goes by air-ship to visit her son, who lives a hemisphere away from her. She is repelled by the unaccustomed contact with the outside world and her fellow-passengers, and a direct ray of the rising sun through the window fills her with revulsion. As the air-ship crosses the Himalayas, once the roof of the world, she commands the attendant to lower the metal blind, saying 'These mountains give me no ideas.' Later they fly over the Caucasus:

> 'No ideas here', said the woman and hid the Caucasus behind a metal blind. In the evening she looked again. They were crossing a golden sea, in which lay many small islands and one peninsula. She repeated: 'No ideas here', and hid Greece behind a metal blind.

The full irony of the passage would probably be lost on most contemporary university students.

When the friend I spoke of flew over India a few months ago for the first time, the attendants lowered all the blinds in the aircraft so that the passengers could watch a cheap American film. The majesty of the Himalayas, the colors of the jungles, were lost to view. Many of you will be reminded of the Leunig cartoon, in which a man is sitting in front of a television set, enjoying a sunset, while the identical sunset is visible through the window behind him.

What Forster and Leunig are telling us is that there is no substitute for unmediated experience. Our chief problem with an encroaching technology will be to retain the right to have such experience. The struggle for this right will not be easy. The most disturbing aspect of the age we are moving into is the increase in surveillance made possible under electronic feudalism and the increasing difficulty in calling

to account those who are really the decision-makers who are thrusting innovations upon us without our consent. The tendency of elected governments to evade control by the electors once they are in office, the web of dependence on, or involvement in, hidden power structures over which there is no electoral control must not be under-estimated. If we do not face up to the question who is to control technology **now,** it may be too late.

Conclusion

Finally, there is an aspect of being human, of having a human face which must be mentioned, even if it is of concern to a diminishing number of people. Yet there are still many people in the western world and in the east who retain some belief in the doctrine that human beings were made in the image of God, or that each human being contains within him or her a spark of the divine, which, however tiny, can be coaxed into life if circumstances permit.

If we would wish our human face to bear any resemblance to the divine image it can only be by resolving the false divisions between the flesh and the spirit. To allow one or the other to dominate is to lose what makes us uniquely human, to lose what alone we can offer to God. We can discover this human fullness by extending our awareness, by rejoicing in the infinitely rich variety of the created world which has been given to us. The danger of the machine is that it tends to turn our gaze inwards towards our own 'cleverness' and so may gradually separate us from what is 'other' than ourselves, leaving us content with uniformity and the second-rate. It may be that we have still much to learn from the Genesis myth of the Garden: It may be that the statement: 'In the sweat of thy face shalt thou eat bread' is not, as we have always thought, a punitive statement, but an indispensible guide to the getting of wisdom. Beside that myth stands the other great myth of the first prototypical laborers: Cain and Abel. The proximity is no accident. We need to meditate more carefully on the implications of God's question: 'Where is thy brother?' and on why Cain's answer was unacceptable.

BEING HUMAN IN A TECHNOLOGICAL AGE: AN EDUCATIONAL RESPONSE

J. Davis McCaughey

Introduction

We all enter discussions of this sort with some assumptions about the technological age and I had better reveal mine, contradictory though they may appear.

The first is that many of the achievements of the technological age have enriched the lives of human beings by giving them increased opportunities for a fuller life. There are more areas of choice for more people, not least for women. Life is more comfortable and healthier, at least for some, in our industrial societies. In those societies we have reduced drudgery, and that is a great gain.

Secondly, technology is here to stay, and, in so far as it is the child of the curiosity of humans and their attempt to control their environment, it is to be welcomed. It is an expression of our urge both for wisdom and for power.

The third assumption is that, drudgery apart, technology has not to date solved any problem of any profundity. Poverty, war and the relationship between the sexes all remain areas of human life fraught with great hazard and any suggested solutions remain acutely problematic. Let me quote Denys Thompson:

> Of 19th century industrialism it may be said that it produced large quantities of goods and services but failed miserably to apply them to the relief of poverty and unhappiness. For the present century it may be claimed that it has solved many problems of distribution but has not really much idea of what to do with industry except let it run on. Industry has not been used to satisfy the true needs of humanity but has continued to serve the well-to-do and has imposed imitations of their affluent ways upon less affluent people. Society has used its energy to produce and consume an even larger volume of less valued goods . . . A sort of capitalism has continued to function automatically long after it had achieved the end proposed for it by its exponents of the previous century[1].

It would appear then that society has no recognised way of applying technology to industry or communication or, say, medical science except to let it run on a great deal faster than before. But to what end? And in whose interests? It is not the purpose of this paper to try to answer those questions, which in any case must be addressed by men and women in a variety of disciplines: by social scientists, including economists, who still think of themselves as political scientists and philosophers and not as number crunchers for whom the computer is a sophisticated toy on which to play games with human lives. They have to be faced by medical scientists in conversation with moral philosophers, lawyers, theologians and so on, determining whether, because we can do something, we should do it. But I want to confine myself to what I hope is a specifically educational question: what can we do educationally to keep people human and to enable them to become more human?

Education, I assume, can make men and women more human. Its absence can dehumanise. I doubt whether it can affect social change. A long time ago Sir Fred Clarke argued very powerfully that education does not affect social change, it only reflects it. Fundamental to that humanising capacity is the development of the power of speech. To rob a people of their language is to deprive them of their dignity,

their capacity to speak for themselves. To be given a voice, to be heard, is at least a start on the way to having control of one's own life. Paulo Freire and others writing about the pedagogy of the oppressed tell of the importance of literacy in the struggle of men and women for freedom. 'Respect for the word', said Dag Hammarskjold, is the first commandment in the discipline by which a person can be educated to maturity — intellectual, emotional and moral.

This has far reaching implications into which we cannot now go, nor would I have the competence to lead you. Intellectual discrimination, moral judgement, emotional stability and religious faith — certainly Jewish and Christian faith — all depend upon the responsible use of language. It may not be without significance that decline in adherence to the Judaic-Christian tradition and the growth of sects based to some degree on oriental mysticism have coincided with the loss of precision in the use of words. But, as I say, we cannot go into all that. For our present purposes let me press two questions: first, when we find ourselves under pressure for survival (or aggrandisement) by acquiring technological skills, ought we not also give renewed attention to the mastery of language and of languages? Secondly, since language comes to us not only spoken but written, what should we be reading and how should we be reading it?

Language and Languages

First then the question about the learning of language. The mastery of spech is a sign of being human. It is one way, a decisive, permanent and persistent way, in which humans do not merely suffer from the disturbances of their environment but react to them, bring them into focus, under control or escape from them. We talk something out, or we talk through a problem — it is not necessarily solved, but it becomes more manageable or at least less fearsome. 'The chimpanzee does not talk, not because he cannot speak but because he has nothing to say', remarked a reputed anatomist of a previous generation. However difficult it may be to describe the borderline between the human person and the chimpanzee, difference would be discerned in the quality as well as in the manner of communication. That dictum about the chimpanzee reminds us that philosophers and theologians, from the Greeks and the Hebrews to Heidegger, have insisted not only that human persons are speaking animals but that they are capable of discourse. *Rede* like *Logos,* reasonable discourse, is to be distinguished from *Sprache* (language) and from *Gerede* (idle talk).[2] Hearing and keeping silent are parts of that discourse. In exercising the choice to hear, to listen and to respond in words or to remain silent, the human person uses his or her freedom and thereby shows him or herself to be free. By means of serious speech, human persons move into a new era of discourse. As we say — they walk through a French window into another world.

There has been much discussion in Victoria, and I have no doubt elsewhere, on whether the university student of today is as literate as his or her predecessors. There are all kinds of difficulties in arriving at agreed methods or data for coming to a conclusion on such a matter. What is perfectly clear, however, is that in Australia we are nothing like as articulate or literate as we might be. As far as I know, no-one has refuted the assertion that accurate knowledge and use of one's own language depends to some degree on knowing another. Certainly this has been an unusually monolingual community, and thereby less articulate, less richly human. Perhaps there have been excuses for this in the past; excuses more than reasons but now

the excuses have worn thin. Today a high proportion of our school children come from bilingual homes but if this enrichment is to be retained and developed it must be by a selfconscious effort. That effort might begin by asking whether we suffer from certain prejudices in this regard. If I were as bold as Dr Samuel Johnson I would suggest that we clear our mind of cant and I would list the following items:

1. That there is something called ethnic languages which are spoken by recently arrived Australians and which, as a concession, may be taught in special schools on Saturday mornings by members of those communities. Whereas there are, by implication, literary languages, French, German, Latin, which, however weak their hold on the secondary school curriculum, are still worthy of respect.

2. That you have to wait until secondary education to teach children a language other than English, when it is known that up to puberty children learn a language through the ear. After that we all have to go through the painful process of learning where to put our tongue in relation to our teeth, and how to pronounce an uvular 'r' — a particularly damaging piece of cant when we are surrounded by native speakers of Southern European and Asian languages.

3. That those who are to be well educated scientifically and in mathematics will have no time to learn a foreign language or to pursue it beyond the earliest days of secondary education. What makes the Australian school child incapable of the allround education which causes his or her contemporaries in other countries so little trouble?

4. That education in languages is something particularly academic, of interest only to those proceeding to tertiary education, or indeed, more limitedly, to the Faculties of Arts at the universities. Apart from the weakness of having monolingual doctors and lawyers, not to mention social workers, experience over a long period of time in many countries suggests that a grasp of a second or third language does not depend on the capacity to master tertiary studies.

5. That languages have to be learnt slowly and painfully. But note the experience of wartime and forget not the tools that modern technology has put into our hands.

Having rid ourselves of these prejudices, we should perhaps go on to reflect on the great injustice which we do to many of our fellow Australians in depriving them of a disciplined knowledge of their own languages. Then we might remember the impoverishment which we ourselves suffer through not having our eyes open to look at the world in different ways. I use the term 'we' and 'them' here, because I observe, in looking down the list of members of this conference, there are very few non-Anglo-Saxon or Anglo-Celtic names. Most of us, overwhelmingly, are English speakers first.

To take an illustration and not put a good thing past my own company, in my trade even a smattering of Hebrew and Greek can make a student aware of the subtleties, the grandeur and the earthiness of the Biblical literature. I deplore the deteriorating standards of education of the clergy of all the churches in this regard. Similarly, even a small and labored acquaintance with French and German may suggest that there is a philosophical tradition distinct from and complementary to

that of Oxford. But it is chiefly in what I lose by not being able to speak to my neighbors in their own tongue and read their literature, that my impoverished state is brought home to me.

Reading, especially Poetry

It is time now to turn to our second question, about written texts. Heidegger, in a neighboring passage to that to which I have already alluded, comments that 'communication is never anything like a conveying of experiences, such as opinions or wishes, from the interior of one subject into the interior of another'. It always depends on 'what it said-in-the-talk'. In other words, some of the most important communications between humans are not intersubjective — teachers to taught for instance — but depend upon a spoken utterance, a written text which is objective, which stands between the speaker, the author and the hearer, between the teacher and the taught. Paul Ricoeur describes the matter in another way when he observes that when the author writes, the reader is not there and when the reader reads, the author is not there.[3] The communication through the written text implies what he calls a certain distanciation or distancing. The relation between author and reader is not direct but is in each case a relation with a text. It is as much there, outside the author and reader, as a sculpture is a monument in stone, standing there to be observed.

It is sometimes said that girls in secondary schools do better in the study of literature than boys, and the reason given is that they are less afraid of their feelings. That may be, but it should not be the point. If one reader is better than another reader, it should be because he or she sees more accurately what is there; what is written in this text by words in this order to convey such and such a picture, by means of symbol (image), by means of myth (which is symbol or image in movement), by legend, by extended narrative, by story, by reasonable discourse.

If I am not being tedious, or despite that I am being tedious, I should like to take up another matter. We spoke of the learning of a language as enabling us to look out on the world through a window. A text, a piece of writing — be it a poem or novel or other imaginative writing — may be thought of, not as a window through which we learn about the poet or author or anything else, but a mirror, a series of mirrors which disclose to us a world or series of worlds other than our own world and yet within which we see reflected some of our known or unknown concerns. (I owe this suggestion, though not necessarily my misunderstanding or misstatement of it, to Murray Krieger's interesting book on Shakespeare's sonnets.[4]) We live within a tradition of writing which holds up to us a mirror or series of mirrors in which the human scene, or nature, is reflected in all its terrifying ambiguities, dilemmas, beauty and ugliness. To be truly and fully human is to allow ourselves to be exposed to those pictures, to see ourselves in perhaps a very unobtrusive corner of that scene — rather in the way in which some Renaissance painters found themselves almost by surprise in a corner of their own canvases.

If this is to happen, we have to have time to read and some things we may have to read slowly. It was one of the merits of the old style classical education that it introduced a student to a few texts, but he or she had to study them thoroughly, read them slowly. It had its limitations, but that was one of its strengths. A frightening possibility about education in a technological age, is that it will attempt to speed

up the process of learning in every sphere. That will be good for the learning of languages. It may be bad for the learning of reading. Of course we must learn to read widely, to become acquainted with more and more literature on more and more subjects, but we have also to learn to read intensively and slowly. One of the great merits of learning to read poetry is that we have to read it slowly. Denys Thompson quotes Thomas Hardy as saying that 'The shortest way to good prose is by the route of good verse'.[5] The man or woman who has learnt to observe the craftsmanship of a sonnet by Shakespeare or John Donne ought never again to be satisfied with slovenly speech. But also, the careful observation involved in good reading is no bad training for the medical diagnostician, who must, for the sake of us all, learn to see what is there, not only as another example of a general case of disease, but also to see his or her patient as a particular case. No amount of technology can obliterate the distinctive character and peculiar needs of that patient, any more than one can say of the sonnets of Shakespeare, 'Read one and you have read the lot'.

But there is more to the making and reading of poetry than that. 'In our age', wrote W.H. Auden, 'the mere making of a work of art is itself a political act. So long as artists exist, making what they please and think they ought to make, even if it is not terribly good, even if it appeals only to a handful of people, they remind the Management of something managers need to be reminded of, namely, that the managed are people with faces, not anonymous numbers.'[6] Or think of the poetry of dissent which has come out of Soviet Russia. I take the example of Anna Akhmatova, who lived through the Stalinist regime, and was constantly preoccupied with three questions: What is it to be a woman? What is it to be a Russian woman? What is it to be a Russian woman who is a poet sharing the terrible experience of those years? Through it all there is the determination 'not to forget' and 'not to allow to be forgotten'. 'If there was anything she feared', wrote her biographer,[7] 'it was not pain and suffering, but that she might forget what they meant, and thus betray those women who had stood with her outside the prisons in 1937 and 1938:

> Was it not I who stood at the Cross
> Was it not I who drowned in the sea,
> Have my lips forgotten your taste
> O pain!

What I have been trying to do, is not to make out a case for the study of the humanities as one group of disciplines among others. I have been trying to suggest that the human race, if it is to remain human, must be exposed to the great stories from the Iliad and the Odyssey and the Old Testament sagas onwards, in which humankind found itself reflecting upon its questionable existence on the face of the earth. What will be found there is essentially qualitative data, but nonetheless demanding more reasonable reflection than do quantities. It would be comforting to know that those who devise plans for immigrants and who seek to understand the human needs of migrant communities have read Isaac Beshevis Singer and perhaps a dash of Conrad, as well as the data provided by demographers and social scientists. It is sometimes given to the poet to place before us, in a style so incisive that it makes an immediate impact, a fear which otherwise is either hidden in our unconscious minds or is exploited by crude propaganda.

Think of Robert Lowell's picture of Csar Lepke of Murder Incorporated, the

gangster whom he saw in prison reduced to harmlessness and delivered from any sense of guilt by surgery of the brain and think of the dehumanisation involved, and of the alternative. No criminologist could state it more incisively:

Flabby, bald, lobotomised,
he drifted in a sheepish calm,
where no agonizing reappraisal
jarred his concentration on the electric chair —
hanging like an oasis in his air
of lost connections . . .[8]

Poetry, at its best, is utterly opposed to the ideological mind, that disease which so besets us in the 20th century. The poet, like other artists, sees the world not in generalities or the abstractions so beloved by the adherents of every kind of-ism but in its specific concrete images of reality. Think of Ted Hughes' picture of the final terrible human disaster; war with all its traditional images blended with some taken from technology. You will bear with me if I ask you to read the whole of this poem which was certainly not written merely for students reading English Literature, but for you and me.[9]

CROW'S ACCOUNT OF THE BATTLE

There was this terrific battle.
The noise was as much
As the limits of possible noise could take.
There were screams higher groans deeper
Than any ear could hold.
Many eardrums burst and some walls
Collapsed to escape the noise.
Everything struggled on its way
Through this tearing deafness
As through a torrent in a dark cave.

The cartridges were banging off, as planned,
The fingers were keeping things going
According to excitement and orders.
The unhurt eyes were full of deadliness.
The bullets pursued their courses
Through clods of stone, earth and skin,
Through intestines, pocket-books, brains, hair, teeth
According to Universal laws
And mouths cried "Mamma"
From sudden traps of calculus,
Theorems wrenched men in two,
Shock-severed eyes watched blood
Squandering as from a drain-pipe
Into the blanks between the stars.
Faces slammed down into clay
As for the making of a life-mask
Knew that even on the sun's surface
They could not be learning more or more to the point.
Reality was giving its lesson,
Its mishmash of scripture and physics,
With here, brains in hands, for example,
And there, legs in a treetop.

There was no escape except into death.
And still it went on — it outlasted
Many prayers, many a proved watch,
Many bodies in excellent trim,
Till the explosives ran out
And sheer weariness supervened
And what was left looked round at what was left.

Then everybody wept,
Or sat, too exhausted to weep,
Or lay, too hurt to weep.
And when the smoke cleared it became clear
This had happened too often before
And was going to happen too often in future
And happened too easily
Bones were too like lath and twigs
Blood was too like water
Cries were too like silence
The most terrible grimaces too like footprints in mud
And shooting somebody through the midriff
Was too like striking a match
Too like potting a snooker ball
Too like tearing up a bill
Blasting the whole world to bits
Was too like slamming a door
Too like dropping in a chair
Exhausted with rage
Too like being blown to bits yourself
Which happened too easily
With too like no consequences.

So the survivors stayed.
And the earth and the sky stayed.
Everything took the blame.

Not a leaf flinched, nobody smiled.

Compare that with the popular speech of any -ism you can think of.

Conclusion

One final note. It can scarcely have escaped your attention that I have not quoted or alluded to any Australian writer. That is not because we are deficient in such, but for two other reasons. The first is that I share this session with a distinguished Australian writer and she speaks for herself. But the second is that only thus can we treat Australian writing and Australian reading and Australian culture with the respect that it deserves, namely, to expose it to the criticism of comparison with the best. If we can help our students to do that, we shall have given them an opportunity to know what it is to be human in a technological age — and that, as that age has made its impact upon them, living in Australia, is no unworthy task for members of the Australian College of Education.

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THEME 4:

IMPLICATIONS OF THE TECHNOLOGICAL SOCIETY FOR EDUCATION

The Future of Schooling in the Age of Technology
Lyndsay Connors

Towards a More Innovative Australia
Peter Ellyard

On Being Humanly and Scientifically Educated
Arthur Peacocke

The Commonwealth Government's Objectives and Priorities for Education and Technology
Richard Johnson

THE FUTURE OF SCHOOLING IN THE AGE OF TECHNOLOGY

LYNDSAY CONNORS

Introduction

This paper concentrates on the future of schooling in the age of technology and begins with the premise that schools are probably the most interesting, rich and complex social inventions of the last century, a century dominated by new technologies which produced an industrial and an associated political revolution.

The Future of Schools

Technological change is a continuous process. But the rapidity of change and the capacity for complete annihilation are new. While humans survive, there will be education. But what of schools? Schools as we know them, and our secondary schools in particular, reflect their origins in industrial society. From their factory-like appearance, to the way their days are organised, with batches of thirty students passed from one operator to the next for a forty-minute period of treatment, many schools lend themselves to industrial metaphors. So it is reasonable to ask, as many now do, whether they will have a place in what we are now calling the post-industrial era. One of the roles of schools is to impart information or knowledge. Those who regard this as the dominant role of schools, and there are still some Gradgrinds, could argue that in the age of the new communications technology, we will soon be able to do away with costly human teachers and replace them with non-unionised machines.

Those of us who are concerned with the future planning and resourcing of schools have to ask ourselves whether micro-computers — for word-processing, for handling information and for simulating the real world — will replace schools. If they will, there is no evidence of it yet. All the evidence seems to point to the contrary.

Far from fading away, there is evidence that schools are becoming, and will continue to become, even more important institutions in our society than they have been to date. We are already seeing an accentuated demand for, and emphasis on, schooling from quite different sources. The political currents around our schools do not suggest that their role in society is diminishing. There are many reasons why. Two are worth commenting on here:

- Schools are not just knowledge factories. They are complex human agencies where the hopes and fears for, and of, our children are played out daily.
- Human beings are intensely sensitive to the contradictory possibilities of technologies, to the fine line between more leisure and unemployment, between release from physical pain and the traps of drug dependence. There is plenty of evidence of people fighting the potential of some technologies to isolate them from others and to destroy their rightful sense of importance.

For example, take childbirth. It is obvious that women want the benefits of the latest techniques, but to give birth in warm surroundings and not in a sterile clinic, isolated from those who care most. The same demand is evident in schooling. The

work of Collins and Hughes, for instance, shows quite clearly that there is a consistent demand for schools to play their part in caring for young people in ways which will contribute to their development as humane citizens, able to play a responsible role in human society.

The Importance of Schools

In its recent Report, *Commonwealth Standards for Australian Schools,* the Commonwealth Schools Commission put an emphasis on the need for increased human resources in schools. The Report noted that schools are faced with an increasing range of demands and tasks and often find it difficult to respond to the human needs of their students. The Report called for more recognition of the crucial importance of contact between students and education professionals, and the provision of an appropriate level and mix of resources to build effective relationships: It argued that while the quality of teaching is paramount, there are clear links between the quantity and the quality of resources. That is the reason why the Report gave emphasis to the need for reduced class sizes and more teachers. The Report has been criticised already and will no doubt continue to be criticised, generally by those journalists and politicians and academics who secure high levels of resources for their own children. The importance of school teachers in developing human capacities for thought and taste and judgment will ensure their place even in, or perhaps especially in, the age of communications technology.

There is another reason why schools will remain important. Joan Sallis, who visited Canberra in 1982 under the Commonwealth Visiting Fellowship scheme, is a parent campaigner for better schools in the United Kingdom. She spoke about the fact that schooling is held out as 'Cinderella's coach' or 'Aladdin's lamp' providing the access to 'the scented ballroom' or 'the glittering cave'. However, she pointed out that the lamp casts its light still for the fortunate few. And yet, for many children school is still the only place where they will get their glimpse of that scented ballroom and those glittering caves. The potential of schooling to improve the lives of children otherwise likely to gain least benefit from our society as it is now organised, will also ensure schools a place in the years ahead.

The Discussion Paper which has resulted from the Ministerial Review of Post-compulsory Schooling in Victoria, chaired by Jean Blackburn, takes up this theme:

> The development of their capacities through general education to the highest level offers young people the greatest hope of self enhancement and fulfilment as well as the most useful preparation for a changing world. The culture which is mediated by the school initiates young people into the common understandings on which the society is based and from which it operates.

The paper goes on to argue that while unemployment has lent urgency to the task of devising better forms of schooling as an alternative to employment, the real issue is not of preparation for full participation in a democratic society.

We can be fairly sure that schooling will become more important and more contentious than it is now in the face of developing technologies. To the extent that these will disrupt the existing pattern of social elites, various groups will enter the fray, some attempting to use schooling to conserve their existing positions of power and influence, others to seize opportunities to forge a new social order which is fairer to all.

Developing Technologies

Contraception Technology

Interestingly, the technologies with greatest implications for schools and perhaps for education in general are those with little application in schools. If I were pressed to say what form of technology is affecting schooling most I would have to say the technology of contraception. The opportunity for men and women to control their fertility and manage human reproduction has started to make profound changes in our society which are affecting schools and schooling.

Women are starting to liberate themselves from the artificial layer upon layer of oppressions all carefully constructed around interpretations of the reproductive role. *Making the Difference*, a study of schools, families and social division, has been one of the most interesting studies of schooling in Australia in recent years. One of its most interesting features has been the noting of the fact that within many households the arrival of reliable contraception, the emergence of the new feminism and the changing patterns of women's employment are producing a revolution. As far as society and schools are concerned, the pill will prove to have more profound implications than the word processor.

To quote that study:

> We did some interviews in households where the position of men and women has actually changed but their ideas about what is proper haven't; and in households which are split, for instance with husbands trying to reclaim an authority their wives or daughters will not concede. In others, perhaps the majority, a vague acceptance that women's place in the world is changing went along with practices that in the main reinforced the status quo.

The four authors then went on to warn that 'In thinking about gender relations, we must be alert to tensions and contradictions with them as clues to what is presently changing or is likely to . . .

Some of those tensions are evident in schools. When the authority of men in the home changes, children are affected along with their mothers. Our schools are now caught in the cross-fire between groups demanding that they recognise the rights of children to be respected and consulted; and those demanding that schools enforce forms of authority which are no longer enforceable in many homes.

More people have children now than in past generations in Australia, but they have fewer than the parents of earlier generations. Having, and knowing that they will be having, perhaps only one or two children appears to be having an effect of making some parents feel that they must get them 'right'. There is a growing concern with the quality of the experience from the very start, at least by those advantaged enough to be socially influential. In an attempt to make childbirth at least an 'event', there are those who would turn it into a competitive performance. And the same of schooling. Much pain is caused by parents for whom knowing that most children are progressing well is not enough; and whose concern is that their own child is out-performing others. The attempt by the privileged to use schools as a means of securing educational advantages for their own children by fair and foul means leads both to educational improvement and to an undue emphasis on trivial trappings of schooling, to demands for teacher quality and smaller class sizes

which benefit all, and to obsessions with uniform and other traditions that have little connection with learning and emphasise exclusiveness.

Labor-saving Technology

As well as contraceptive technology, labor-saving technology is affecting schools. Among western countries, Australia had a relatively long period of being able to educate its young people beyond the elementary stages 'on the job' in the paid workforce. It is only now having to provide in upper secondary schools education in the ordinary business of life, rather than a 'high culture' whose links with real life were only to be discovered by the privileged few proceeding to universities.

Once the fact sinks in that there is no rush to deliver young people into the workforce, it may be possible to remove the pressures which turn schooling into a lock-step exercise which must start at 5 and end at 15 or 18; and to allow young people to proceed at varying rates suited to their own learning capacities.

Military Technology

Surveys of young people in schools suggest that the other technology looming large in their thoughts and lives is military technology. It isn't difficult to relate this concern to the noticeably high levels of anxiety found in many schools and education systems and in individual teachers under stress. It is extremely hard to construct a curriculum which has meaning and significance for young people faced with nuclear destruction; or which can empower them in a world at the mercy of so few and their awesome secrets.

Technologies within Schools

In saying that schools will be more affected by technologies without than within, I am not downplaying the importance of technology in schools, or the potential of technologies to alter the way schools work. There are hopes, and some signs that some technologies — computers, word processors — may be relatively free from the dominance of particular groups and that all groups can approach them relatively equal. There are legitimate hopes that word processing, for instance, may assist children to learn earlier and more readily to write and to read as well as they can speak and listen. And maybe some of the barriers between teachers and students will fall as teachers face the same learning challenges as their students, posed by rapidly-changing technologies. The potential of new machines for disabled students is exciting. On the other hand, there are fears, and also some signs, that quite the opposite of all these possibilities may emerge.

Conclusion

In summary, schools will be one of the institutions through which our society attempts to emphasise the human face of technological change. But the fights about how this is to be done will intensify. The implications of technology will raise questions not about their survival but about which and whose purpose they should serve.

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TOWARDS A MORE INNOVATIVE AUSTRALIA

PETER ELIYARD

Introduction

It is pleasing that the Australian College of Education, of its own initiative, has seen fit to address the critical issue of education and technology.

After its election in November 1982, the new Bannon Labor Party Government made a number of important decisions in South Australia with regard to technology A new Ministry of Technology was created. This Ministry has the responsibility for developing goals, for advocating and catalysing new programs and for auditing programs for the whole of government. In other words, its job is to get others to recognise the technological issues of the day and to do something about them. A new Department of State Development was also established. This Department is the major organisation for actually creating structural change in South Australia's economic base. However, a third election was possibly even more important. This was the decision by the South Australian Premier, Mr John Bannon, to allocate to the Minister of Education, Mr Lynn Arnold, the additional responsibility for technology. This decision to link technology to education was not a superficial one. It was made for important reasons and after careful thought and I believe it will prove to be an historic one.

Last month the South Australian Government released a draft 'Technology Strategy' for South Australia. This 'green paper', which was debated in the South Australian Parliament on 12 April 1984, outlines and describes the daunting problems, challenges and opportunities facing the State. The challenge virtually involves a major reconstruction of the economic and social base of South Australia. A similar change, made by government intervention and leadership, which occurred in South Australia before and after World War II, resulted in the development of a large manufacturing base there. Like the last change, the proposed change will take a generation to implement fully. The day after the debate in the South Australian Parliament, the Commonwealth Minister for Science and Technology, the Honorable Barry Jones, released the first draft of a 'National Technology Strategy'. The national effort is approximately six months behind the South Australian one, for the draft debated in the South Australian Parliament was the second such draft, following the release of a first draft in October 1983 and a period of extensive consultation with all sectors of South Australian industry and society.

The basic challenge set out in the Strategy is to reverse the development pattern which has been underway for fifteen or more years in South Australia. By 'de-development' I mean the conversion of Australia from a developed country into a developing one. Not a pretty thought. In my view the fundamental difference between developing and developed country is that in a developing country wealth is generated primarily by the utilisation of natural resources. Humans can act to increase that wealth, but most exports leave the country in a fairly raw state with little value added. In a developed country, however, wealth begins in the human brain, and is a project of human creativity. The most successful countries in economic development since World War II, countries such as the Netherlands, Sweden and

Japan, have no significant natural resources. Their wealth is due to their creativity, their ideas and their capacity to develop their ideas commercially to generate national wealth.

In these terms therefore there is no limit to wealth — it is only limited by the quality and quantity of ideas and the ability to organise these into economically productive activities. Australia clearly has the characteristics of both, but most worryingly we seem to have more and more of the former in the mix.

Technology is the main means of turning brain power into wealth. Naturally, it goes without saying that wealth generated by technology should be equitably shared. Therefore, appropriate affirmative action programs are needed and mechanisms must be put in place to redistribute wealth to ensure that this occurs. In Australia we have one last chance to reverse the trends of the last fifteen years, or else we will become a relatively poor country on the periphery of an increasingly prosperous Asia, gaining most of our foreign revenue from the sale of unprocessed mineral commodities and agricultural and pastoral products. We will also have a more unequal, divided and violent society with massive unemployment. Most of us would agree that such a future would be something we would not wish. It is an insult to our image of ourselves as human beings, but it is happening anyway. It is lucky, I believe, that the 'so-called' resource boom, which so dominated the 1980 Federal election, collapsed before it started. It reminds us that we now must think our way out of economic decline, rather than dig our way out. This means that we must recognise the critical role of brain power in economic development and establish ways of creating wealth from it. We are very creative people, good inventors. For example, Australia produces more scientific papers per capita than almost any other country. However, we are total failures in generating wealth from this. How many of you know, for example, that xerography was invented in Adelaide. We made a few million dollars,out of it; others made billions. In summary, Australia is an inventive society, but not an innovative one. An innovation is a commercially successful or economically and social useful, invention.

All too often the major use of technology in Australia is thought to be a way of making and doing the same things as before, but more efficiently, and with less labor. In Australia we must use technology to generate a whole host of new economic enterprises and ventures. The real challenge before us as a society is effectively to use our creativity and ingenuity, to use technology to broaden the base of Australian activities, including the creation of the so-called 'sunrise' industries. If we only use technology to make our present range of products and processes more efficiently, then we will face major problems as a nation, for this will produce unacceptable levels of unemployment and social disruption. Technology gives us the opportunity to increase the number of activities and ventures and to generate more jobs. This will require all the creativity and management ability we can muster.

Equally, we must still use technology to rescue much of our ailing manufacturing industry which is inefficient and unproductive, in fact a net consumer of wealth rather than a producer of wealth. This is a critical matter because it is only when our manufacturing sector becomes a significant wealth producer like our mining, agricultural and pastoral sectors, that we will have the financial resources as a nation to do many of the things that need to be done, including further developing the education sector. A major function of organisations such as the one I head, is to

promote the increased use of advanced technology in existence in Australian industry. In many cases the choice is between, introducing new technology with the loss of some jobs, and not introducing technology with the loss of all jobs through the total collapse of much of our industry.

I'd like to outline quickly some of the tasks before us. These are more fully outlined in the Technology Strategy. First we need to increase the resources used by research and development in industry. This includes increased private sector research and development, and a much more successful transfer of research and development from the public sector and educational institutions to the private sector. Many of you perhaps saw press reports in the last week of a study by PA Management International, showing that most Australian industrial managers have absolutely no idea of the critical role of R & D, increasing future prosperity. These managers are products of our education system. Other things we need to do are to increase the availability of venture capital, develop more effective government incentives, procurement policies and 'offsets' programs, promote greater export, better design, better quality and better marketing. We must also nourish new start-up ventures and further improve entrepreneurial and business management skills. These are some of the factors relating to the area of assistance to industry.

Another area which is critical and which needs urgent attention is our industrial relations system. As I have said, it is desperately essential that the maximum level of technological change be promoted in Australia. The result of not doing so will be disastrous. However, it is clear that rapid technological change is a major cause of conflict. Workers who lose their jobs as a result of this process and who are given no other reasonable alternatives, will understandably take a neo-Luddite position and fight such change. Therefore a new era of consultation and communication is necessary. If insensitive and authoritarian management insists on foisting new technology on the workforce without consultation, the result will clearly be disastrous. Equally disastrous would be the unwillingness of the trade union movement to recognise that major adjustments and changes are necessary, including the way they themselves are organised. These managers and trade union leaders are products of our education systsem. A new area of consensus is essential. The prices and incomes agreement between Government and the trade union movement is a first step towards building consensus in Australia. It is no use pretending that these are issues which will easily be solved. Clearly, however, there will be no hope if we pretend that these problems will take care of themselves.

Australia's legal system has to begin to recognise the world technology revolution and that computer crime, invitro fertilisation and the genetic manipulation of DNA are here to stay. The incompetent way that the world legal system is adapting to the computer software issue is a good example of the archaic views of most of the legal profession. Many of our lawyers are terrified of technology and ignorant about it; they are also graduates of our education system.

I could go on listing other areas of concern, however, I think you will agree that we face some daunting challenges. The first thing we must do is to make out such a shopping list of concerns. A useful starting point is with a reading of both Technology Strategies and Barry Jones' book, *Sleepers, Wake!* However, these examples indicate that the changes we need to make are indeed huge and will require a major rethink and effort from all of us.

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Technology is our own creation and is the product of some of the most creative efforts of human beings. Some of us are fearful of it, believe it to be a major threat and producing few, if any, benefits. Most of us, however, probably believe that the benefits have outweighed the costs, and technology is usually seen as a net gain, even though the costs can be significant. However, it is a mixed enough blessing, and in its most vile form, military technology, is certainly a scourge on humankind. A study of the history of humanity shows that technological change has been an integral part of evolution. Humans created technology and in turn were influenced by it. Early technological developments evolved over long periods of time Apart from perhaps the period from 1780-1830, this is the most rapid period of technological change in human history. It is not clear yet whether this will accelerate further, or flatten out to a plateau where the rate of change will slow down again. It is apparent that people are able to adapt to slow changes, but are ill-suited and perhaps ill-prepared to cope with higher rates of change. The industrial revolution, with its mills, mines and factories, together with 'tied' housing must have appeared as a Godsend for many farm workers, existing on a pittance in a more feudal type agricultural system. But the Godsend turned into hell for many and the new technologies which had been welcomed, were overtaken by others which threatened their existence.

The major challenge facing us all in terms of the technological revolution concerns the challenge placed on the educational system. I am aware that I will be suggesting that even more demands be placed on an already over-stretched education system. One of the main things we must do is keep people in the education system longer so that we can achieve more. In this discussion I will not be talking about technology in education, either for learning or administration. These are related to the 'means' of education, and are the province of professional educators. I want to concentrate solely on the 'ends' of education rather than the means and how the current technological revolution demands that we question critically the main purposes and goals of education.

A response to the new situation is needed, but education itself must *anticipate* a means of helping to change and prepare Australia. In other words, we must determine whether we want to go, and use the education system to help to achieve this, and not merely respond to the perceived technological imperatives, always trying to 'catch-up'. Our actions must be thorough and comprehensive. Facile responses, such as putting more computers in schools will do very little to help us solve the more fundamental problems. We require a dramatic redirection of our education system to do some new things and do some old things much better. We must address the whole education system — early childhood, primary, secondary, tertiary and TAFE. The South Australian Government has recently set up an Education and Technology Task Force to delineate the goals of the education system so that we can better anticipate, respond and prepare for the rapid period of technological change, and to help develop a more creative and innovative society. In addition, it has been asked to develop more detailed action plans for each sector of the education system, so that it can realise these goals. Last November, the South Australian Minister of Education and for Technology was able to convince the Australian Education Council to set up a similar National Task Force, which is now being set up in Canberra. He is chairing that Task Force.

What are some of the challenges facing us and what are some of these goals? If I were to express my general view about the present education system, I would perhaps say that it was preparing Australians for a 1955 Australia, rather than a 1985 one. It assumes, for example, that skills and knowledge developed early in life in the education system are suitable for one's whole life and that no significant updating was necessary. It assumes that plenty of jobs are available for less-skilled people. It assumes that people hold jobs virtually for life and do not have to be re-educated. This clearly ceased to be the case many years ago.

I now wish to mention a few facets of what I think must be developed in our education system. These must be considered by the various task forces. There must certainly be a much greater emphasis on education throughout life. Skills and knowledge are rapidly changing and are being dated with ever-increasing rapidity. The same can be said for the rate of creation of some jobs, and for the disappearance of other jobs. The nature of work is undergoing dramatic change. The major component of this change is technology. Therefore, we must develop a system which emphasises education throughout life. It is not unreasonable to think that in the near future we will have a situation where 10 per cent of anyone's job will be learning for the next job. Not only do we need the education system to provide this sort of education, we must also develop in people the desire and the capacity to grow, and to learn throughout life. Therefore, a major emphasis must be on technical and further education, and on in-service education.

Professor Tom Stonier, of Bradford University, gave an interesting paper at the National Technology Conference last September in which he portrayed the need for a much larger education industry. Indeed, he visualised one so much larger, that it would have a major impact on unemployment. The thought of a larger education sector in the present economic climate is impossible to conceive. It is difficult enough to maintain the present levels in real terms and to allow for some modest increases. A larger public sector will be needed to support a larger education industry. This will in turn require, in particular, a much more productive and profitable manufacturing sector to provide the taxes to allow this to happen. In addition, it is clear that industry itself must be much more directly involved in education. The concept of people as vital resources which must be nourished, rather than dispensible resources, is foreign to many Australian industrial managers. However, it is critical that we develop this attitude. The problem then, is not technology, but the development of capacities and skills in our people. We cannot have an industrial renaissance based on intellectual resources, while we treat our workers as dispensible units of production.

The South Australian 'Technology Strategy' states the goals of the education system to be:

- increase public understanding of the relationship between technology and political, economic, social, and ecological change;
- improve the ability of people to adapt to technology induced change;
- increase the State's intellectual and creative resources and workforce skills;
- improve entrepreneurial and self-realising skills; and
- provide a broad-base education for all throughout life.

The issue of participation rates has recently been elevated in status. It is clear that these must be dramatically increased, both in terms of the school system and for continuing education and tertiary education. Participation rates in Australian education beyond compulsory years are very low compared with other developed countries. Perhaps the biggest single challenge is to make more people *want* to participate more in education. In other words it must become more enjoyable and be more rewarding. We also need to especially promote the greater participation of the female section of our population in a wider variety of educational pursuits. This is a big challenge to our educators.

The education system must work at two broad levels. First, it must develop individual 'life skills' or capacities in people. These include:

- a higher level of self-starting, self-realising and entrepreneurial skills than at present,
- a constructive yet questioning attitude to technology, which is neither uncritical adulation, nor neo-Luddite abhorence,
- a recognition of the relationship between science and technology on the one hand, and social, economic and ecological change on the other;
- a willingness to seek constructive and co-operative arrangements to deal with technological change in the workplace and in other areas;
- a commitment to sharing equitably the benefits and costs of technological change;
- a capacity to utilise educational services on a continuous basis better in order to improve levels of skills, particularly work skills and to develop new areas of knowledge throughout life; and
- a world view, a greater concern for global as well as national and regional problems. If we are going to trade more with the world, we have to be much more perceptive about the needs and interests of other cultures.

The additional major responsibility placed on the whole education system by the issues raised in the strategy statement is to help to create a society which is more creative, more respecting of innovation and more entrepreneurial than at present. I think it is important that we look at our education system and try to decide whether we have been at all successful in achieving this so far. Some would say that we have been a dismal failure, and that initiative, creativity and entrepreneurship have been discouraged, or even crushed out of our youth by an education system that sees its major role as an imparter of factual knowledge, and has developed assessment systems to measure this as its major purpose. In the 1950s we might have needed a population who were obedient followers of orders. Now we need more creative, co-operative givers of orders, initiators and people who are taking good ideas, people, money and materials to make economically productive work on 'ground'.

The word entrepreneurship, is to some a 'bad' word. Let me say what I mean by it. I do not have in mind those captains of industry who mostly swallow other people's creativity to build ever larger conglomerates. What I mean is that we need a nation of people who have creative ideas, who respect and admire these in others, who are capable managers of people, money and materials and who have highly developed skills in communication. I believe the education system must concentrate

mostly on this, as its major purpose. Some people might think of this as an elitist concept, and that only a few people will ever be creative or enterpreneurial, or that these capacities are reserved for the few. Everyone should be more creative and entrepreneurial in his or her work, irrespective of the nature or status of that work. These capacities can be and must be nourished and developed by the education system. It is clear also that people must understand technology, work with technology and be comfortable in working with technology. This will only develop if people are actually using it in a creative way. Creative people, comfortable in using technology will only be developed if we set about to re-design the education system to give these matters the highest possible priority.

A great deal has been said about the coming world situation where jobs will continue to be in short supply. Many are suggesting that we must prepare for a world where many people have no work and that we must educate primarily for leisure. Whilst this should not be overlooked, it must not predominate in our thinking. The only limitation to the capacity to create jobs, is our lack of good ideas, or of managerial skills to turn these good ideas into meaningful economic activities. For example, in Australia, the Macadamia nut which grew in the rain forests of Queensland was not seen as an economic resource until the Hawaiians saw its economic potential. Likewise Australian wildflowers, such as banksias and Geraldton wax, are now being grown in Israel and South Africa for European flower markets. We did not have the idea that a major economic activity could be built on our wonderful genetic resources; others did. It is the lack of creative ideas and management skills which is a large part of our problem as a nation. We have to use our brain power to create more diverse economic opportunities for world markets. We have to develop in Australians the idea that economic activities and jobs are created by people and that technology is one main way of turning ideas into economic wealth. Our managers and our workers must understand that relevant research and development is a vital investment in our future. Without sufficient R & D, and without a commitment and capacity to turn R & D into economic ventures, we will have only a future as a poor, derivative society in an increasingly innovative region. Our economic success will be dependent on these factors, more than on any other factor. It is up to us to use the education system to make a quantum leap in developing this capacity in Australian people. I think all Australians must develop these capacities in people. All of us should be given the skills in our education to be self-employed, and to generate jobs for others. Most of us can become innovators, even if we are not bosses, provided the bosses let us, and that is another challenge for the education system.

This is not the only thing, of course. We also need a major shift in the kinds of 'work' skills we develop in our education system. In the professional ranks we need more engineers, technicians and scientists of all types. We need relatively fewer lawyers, doctors and dentists. We need to develop programs which use both 'sticks' and 'carrots' to encourage more people to enter the former group rather than the latter, and particularly we must encourage more women to make such changes. It is worthwhile noting the much lower ratio of engineers to lawyers in Japan compared with Australia. We need also to look at the artificial barriers created by historical precedent which prevent, for example, apprentices and technicians becoming professional engineers and scientists.

We educate them by two different streams, with strong relationships to class. We can develop an engineer from a technician by an appropriate transition program if we set out to do it. It will be necessary too, for engineers and scientists to have a broader educational base than formerly with greater emphasis on the social and human implications of their work.

We must also spend more time relating our education system to our industrial base and vice versa. For example, in South Australia we have a productive agricultural machinery industry. Incredibly there is no academic or degree course in Australia in agricultural engineering. This would not be tolerated in most other countries. However, it is an example of how little our educational system, our public sector R & D capacity and our industrial base have to do with each other. Many of our educational establishments at the tertiary level are just simply not aware enough of their responsibility to industry. In the last twelve months very large efforts have been begun to correct this mismatch and in the time ahead major changes will be made.

There is at least one other important aspect of this matter and that is specific technological education leading, usually, to a profession such as engineering. If Australia is to take its place among the technologically competent and technologically oriented nations, it must develop, expand and improve its technological education. If this does not happen then, we will find that we cannot maintain our standards of living, we will be unable to maintain our welfare system and we will not be able to contribute to the improvement of third world countries. To put this in the future tense however, is factually incorrect. Australia has already slipped considerably in the generally accepted league table of productivity and exports from the upper third to the lower third of the countries considered and this has already eroded, in a relative sense, our average standard of living. It is not too evident as yet since those that 'have', economically speaking, have not lost a great deal and there are many ambitious young people who are improving their standard of living. However, we only have to look at the increasing inequities in our society to see how our average standard of living has fallen, and that opportunities for many have and are, disappearing. We have to attack this problem in the 'work skills' as well as the 'life skills' area. In addition our schooling needs the following further components:

- All subjects should use technological examples where possible and the relationship of the topic to technology should be discussed. An example is in teaching English language where the elements of physiology relative to speech should be discussed so that the child has an understanding of the mechanisms of sound production and how the child can effect changes. The technology of the different forms of writing should be discussed, pen, typewriter, newspaper printing, word processors, etc.
- All subjects should be taught using information technology.
- There should be specific teaching relating to technological developments, the workings of individual equipment and likely future developments.
- In upper primary and secondary schools there should be specific instruction in the effects of technology on the community, the benefits and disadvantages, as well as the development of a capacity for critical but unbiased assessment of technological repercussions.

- In secondary schools, the application of science to technology should be given much more prominence.
- In secondary schools, children with a technical bent or a leaning to the trades should be encouraged.
- Teaching and learning that leads to the enhancement of critical thinking, creative thinking, curiosity and positive thinking.

Conclusion

In summary, the problems facing the education system have very little to do with technology. There must be a much greater emphasis on 'life' skills in the formal education period, while increased education in 'work' skills should be increasingly the responsibility of an expanded continuous education system. Certainly we must all become more competent and knowledgeable about technology. That will only come by using it in many different ways, rather than merely talking about it. However, the main challenge is to develop in Australians the capacity to be creative, innovative, self-starting, self-realising and entrepreneurial.

These comments, of course, are not meant to be comprehensive. The South Australian Government has set up a task force to address these matters in a coherent, logical and thorough fashion. While this is happening, we must stimulate discussion and debate, and an increased awareness about the critical urgency of the situation. Education has always been about developing skills and capacities in people. However, these skills and capacities need to be different from now on. When the promotion of creativity, innovation and management skills and a commitment to quality and excellence are given as much attention as other subjects in the formal school system, including having these assessed in the same way as traditional subjects, I will believe that we are really on a new track. We just cannot afford to think that these will be developed as a byproduct of education. Our experience shows that they will not. The first task is to develop and articulate the goals for the education system. Then we have to implement detailed action programs to realise those goals.

ON BEING HUMANLY AND SCIENTIFICALLY EDUCATED

ARTHUR PEACOCKE

Introduction

The theme of the deliberation at this conference is the *human* face of technological change and an important emphasis has been on how to go on being human in a technological age and how education can help this aim. For some years I have been interested in the character and possible development of our concepts concerning the human relation with nature, that is, the non-human world, both living and inorganic. The reason for my interest in this relation has been the problem with which you here are all familiar, for it is the hidden agenda of any consideration of the human face of technological change, of how one can obtain a value system to regulate human predation and exploitation of nature.

The dilemma has been acutely and cogently delineated by Lord Ashby in the course of an argument he makes for wider recognition of humankind's biologically symbiotic relationship to both the living and non-living world and of the dependence of our own survival on preserving the delicate stability of natural ecosystems through more gentle and discriminatory attitudes to them. He then continues:

> Considerations such as these are enough to provide the rudiments of an environmental ethic. Its premise is that respect for nature is more moral than lack of respect for nature. Its logic is to put the Teesdale Sandwort (a 'modest little plant' whose existence in its last site in England was threatened by a proposal to build a reservoir there) . . . into the same category of value as a piece of Ming porcelain; the Yosemite Valley in the same category as Chartres Cathedral; a Suffolk landscape in the same category as a painting of the landscape by Constable. Its justification for preserving these and similar things is that they are unique, or irreplacable, or simply part of the fabric of nature, just as Chartres and the painting by Constable are part of the fabric of civilisation; also that we do not understand how they have acquired their durability and what all the consequences would be if we destroyed them.

Clearly this powerful and impressive plea goes beyond what biology *per se* would prescribe for human survival. For he is urging that the natural can have a value in its own right and must be given weight in our decision-making in addition to any cost-benefit analysis based on the desire for human survival. But in order to argue this he has to introduce aesthetic considerations that appeal to a general consensus among his technological readers that, for example, a piece of Ming porcelain, a painting by Constable and Chartres Cathedral are generally agreed to have a unique value of a kind that would designate as barbarian any community that destroyed them.

But can we share his confidence in the broadly humanistic stance of our biologists and technologists, for example? The continual divergence of C.P. Snow's 'two cultures', of the natural sciences and technology, on the one hand, and of the humanities (including religion, in general, and Christianity, in particular), on the other, has proceeded to an extent that has actually made science and technology appear as the enemy of humanity to many young people in the industrialised world and to an even wider range of citizens of the so-called under-developed world. It

has even led to a loss of nerve and of a sense of vocation among many highly qualified young scientists and technologists who now doubt whether their life's work is actually going to benefit humanity. These questions cannot be ignored in our society and, in particular, in our educational aims.

My approach will be first to examine the origin, virtues and weaknesses of the naive scientism that dominates the outlook even of many mature scientists and technologists. I shall then attempt to place this fallacy, of naive scientism, in the wider context of a consideration of the relationship of different modes of knowing, including the relations between different sciences. Finally, I shall urge that to view science as a fallible, but exciting, *human* exploration into the nature of *some* aspects of reality is to allow at least the possibility of restoring both it and its progency, technology, to their earlier roles as principal contributors to human dignity and welfare.

Naive Scientism

With many an adolescent's increasing understanding and appreciation of the scientific account of the world — that is, of the marvels and intracacies of the natural world and of the experimental wonders of scientific investigation and technological application — it is not uncommon that a naive 'scientism' rapidly develops and dominates their total cultural outlook. By 'scientism', I mean that constellation of attitudes which assigns truth only to statements that are scientifically formulated and tested and which gives priority to the 'realities' so authenticated over and above all other modes of human understanding. These other modes are at the same time regarded as personal and non-communicable, and as relating less to 'truth'. The attractiveness of such a 'scientism' to the young person gradually becoming aware of the almost incredible complexity, yet unity, of the natural world should not be underestimated — or despised. It is, for many, the first awakening of real intellectual delight in a world of being other than, and outside, themselves. This is a world that is apprehended through disciplined thought which, perhaps never before, has yielded them such impressive rewards. Yet this fruit of the tree of knowledge can be a seduction if it leads, irrationally but not unnaturally, to an exclusion of all other modes of thought and experience as meaningful in the apprehension of truth and conduct of life. After starting as an expansion of human experience, the acquaintance with the world of science can thus too easily become a constriction and confinement of personal understanding. It is on these wider grounds that it must, in my opinion, bechallenged. In England, Her Majesty's Inspectorate, which is a body of educational advisers to the Government independent of all politics, has proposed that any educationally sufficient common curriculum must include eight 'areas of experience' to which pupils should be introduced: aesthetic and creative; ethical; linguistic; mathematical; physical; scientific; social and political; spiritual (*Curriculum 11-16*, Her Majesty's Inspectorate Working Papers, 1977). These delineate exactly, and pertinently for our present context, the balanced awareness of different modes of thought and aspects of living which education should seek to engender. Were that to be achieved, there would probably be less cause for concern with either 'naive scienism' or with science-and-values issues *per se*.

It seems to me that ne achievement of such a breadth in education should be a primary objective of being humanly educated and cannot be overstressed. The relation of science and values in education would take on a very different aspect

in an education that both attained the breadth of that advised 'common curriculum', and continued to be concerned with maintaining that breadth during the years students were at secondary school and university. In this respect, it is not adequately recognised that much British education and forms derived from it, in the years immediately preceding A-level, are more specialised for that age group, and subsequently, than practically anywhere else in Europe or America. We sow the wind of overspecialisation and we reap the whirlwind of scientism, insensitivity to human values and religious fundamentalism. An understanding of the different criteria, considerations and 'data' that are relevant in deciding on 'truth' in various spheres of human inquiry should be an essential feature of both a humanistic and a scientific education. In each kind of 'map' of human experience, the role of models, analogies and other kinds of metaphorical language, such as myth, should be clarified. This implies a general level of intellectual exchange in a school or university that is both demanding and rewarding but it *is* the essential pre-condition of a civilised education.

Modes of Knowing and the Placement of Scientific Knowledge

We have all, whatever our particular professional academic expertise, from time to time been irritated by those of our colleagues who, coming from another discipline, claim that or discipline X is 'nothing but' an example and application of their discipline Y. The game applies along the whole length of the pecking order of academic life. Thus X may be religion and Y the sociology of ideological functions in society; or X may be sociology itself and Y individual psychology; or X may be psychology and Y neurophysiology; or X may be neurophysiology and Y may be biochemistry; or X may be biology and Y physics and chemistry; and so the game goes on. The game is called reductionism or, more colloquially, 'nothing buttery'. It is practised by an given number of academic players and the prizes are a sense of superiority in those who would otherwise regard themselves, perhaps, as at the end of the line from the point of view of the relevance to human life of that on which they spend most of their lives; and the malicious joy at watching the apoplectic response of one's colleagues as one devastatingly demonstrates that their discipline is not only a waste of time but unworthy of the receipt of grants from limited funds! If the game were merely an exercise in *odium academicum*, which has succeeded *odium theologicum* in the ploys of academic gamesmanship, and were simply a means whereby otherwise inadequate personalities bolstered their own egos and their sense of doing something worthwhile, it would perhaps matter little. It would be just one of the quirks of the academic life which no doubt will, in due course, come under the microscope of the sociologists and the psychologists. However, the game is really much more serious than this, for it is a game which has been played ever since the days when Democritus and Lucretius, by their atomistic determinism, tried to reduce the whole of human life and the history of the world to a mere concatenation of colliding atoms — with obvious implications for the concepts of human mental processes and autonomy.

There are many pairs of Xs and Ys, that is, many interfaces, at which this game may be played. Although the contenders vary, it does seem to me that the game that is played at these various interfaces is the *same* game even when the nature of the arguments between the contenders at first appears very different. Thus, those of us who have tried on occasion to support theological statements find ourselves

having to contend with those who, while listening to us politely, yet know — and soon tell us — that 'of course' these statements are all very interesting but what they are *really* doing is simply to express, say, the social function of religion, or the need for various kinds of psychological appetites to be satisfied. It is not, in my experience, very easy to meet these arguments without at the same time having some general view of the relations between the different kinds of knowledge of different natural systems, including the human, and the different levels at which we operate. Only when these relations have been clarified can we have any hope of assembling the knowledge from the various natural sciences on any broad canvas upon which we may hope to locate human existence and experience.

With an increasing richness and articulation of its various levels, the expansion of our knowledge of the natural world has more and more shown it to consist of a hierarchy of systems, particularly the various levels of organisation in the living world: the sequence of complexity (atom . . . molecule . . . ecosystem) represents a series of levels of organisation of matter in which each successive member of the series is a whole constituted of parts preceding it in the series. This raises the issue of 'whether the theories and experimental laws formulated in one field of science can be shown to be special cases of theories and laws formulated in some other branch of science. If such is the case, the former branch of science is said to have been reduced to the latter'. (Ayala and Dobzhansky 1974: ix).

It is necessary, firstly, to distinguish between the hierarchy of natural *systems* and the hierarchy of the *theories of the sciences* appropriate to those systems; second, to distinguish the uncontroversial *methodological* reduction (the breaking up of a complex natural entity into its component units) that is necessary for research and comprehension from an *epistemological* reduction (often generating, if not very clear-headedly, an *ontological* reduction) whereby scientific theories appropriate to a higher level of complexity in the hierarchy of natural systsems are, it is claimed, logically translatable, in principle at least, into theories appropriate to the next level down — for example, explaining *all* biology in terms of physics and chemistry (a la Francis Crick); or all social patterns in terms of a genetic cost-benefit calculus (a la sociobiology); or psychological events in terms of neurophysiology. In many cases, it can be shown that there is an irreducible difference in conceptual structure that simply will not allow such simplistic translations and reductions and that the theories (and associated models) appropriate to the higher level of an organisation have an autonomy proper to themselves. In this view, subatomic physics is *not* the paradigmatic science in terms of which the whole of the natural world, physical and biological, will one day be 'explained'. This does not mean that the science of one level does not depend on the best knowledge that is available from the science of the level below in the hierarchy of complexity. But it does mean that the science at each level may well develop concepts of its own, appropriate and relevant to the specific behaviours, relationships and properties that can only be seen at that level.

This has interesting consequences. The first arises from noting that the hierarchy of complexity observed in the natural world today has, by means of the sciences themselves, been shown to be an *evolved* hierarchy in which, over long aeons of terrestrial, and even astronomical, time the more complex has evolved from the less so. Thus the natural world has, through time, manifested an *emergence* of new kinds of organisation that manifest qualities, and whose descriptions require

predicates, that are specific for each different level. Most notable among these is the emergence of consciousness and of the self-conscious personhood of humanity.

The second consequence of this recognition of the possibility of the nonreductionist character of the relationships between the sciences is that we have no basis for any favoured discrimination in our attribution of 'reality' to the different levels in the hierarchy of complexity. There is no sense in which subatomic particles are to be graded as 'more real' than, say, a bacterial cell or a human person or social facts. Each level has to be regarded as real, as a cut through the totality of reality, if you like, in the sense that we have to take account of its mode of operation at that level (and woe betide us if, while analysing the oncoming car into its component quarks and baryons, we fail to recognise the reality of the whole!) Even though our present world has evolved out of the 'hot big bang' that was constituted, it seems, of entities even more elementary than those I have just referred to, yet it is still the case that we know something more and new about matter when we see its potentialities actualised in the higher levels of complexity that have evolved on Earth at least. Awareness of this inter-relationship between different modes of knowing could, at the worst, protect the novice scientist or technologist from the wilder naiveties of scientism and, at the best, make him or her sensitive to the wider scope of both ecological and human considerations in decision making.

It should be mentioned, *en passant,* that the philosophical analysis of the status of scientific knowledge completely demolishes the outlook of naive realism that underpins much of the naive scientism of our age. The naively realistic view of scientific concepts and mechanisms is that they are literal descriptions of the world, reproductions of objective reality. In this view, science uncovers the hidden structures and mechanisms of the natural world and shows us what is *actually* there. The merest glance at the world described, for example, by modern physics and astrophysics (with its quarks, gluons, anti-matter, black holes, gravitational waves, 'charm', entropy, 'spin') quickly serves to demonstrate that the ontological status of many scientific entities and concepts is, to say the least, problematic.

So it is not surprising that the judgment of careful analysis of the purported status of scientific knowledge has ranged from the purely instrumentalist and positivist to realistic views of scientific propositions — though naive realism has itself been given short shrift. Positivists and instrumentalists (if we may ignore some finer distinctions) broadly conceive of science as relating observations, for example, the pointer readings of instruments, in order to produce relationships which have the function only of predicting future pointer readings, and so facilitating 'control', thus narrowly conceived. Naive 'realists', on the other hand, take the models and postulated mechanisms, that scientists appear to infer from their observations, as *literal* descriptions of an external reality. Most practising scientists adopt a kind of modified and sceptical realism. For they are aware that most theories are underdetermined by the observations and are aware, to a lesser extent, that most observational 'facts' are 'theory-laden', that is, what you observe already presupposes a theoretical context of interpretation of a particular kind. However they believe that their models are, as it were, 'candidates for reality' — and are encouraged in this view by their increasing powers, not only of prediction, but also of unifying comprehension. Merely to refer so briefly to some of the philosophical positions concerning the status of scientific affirmations is enough to make clear that a naive

scientism is ill-founded on science itself and, in fact, presupposes other judgments concerning the status of scientific 'knowledge' that need to be exposed to the light.

For example, the deeply-embedded use in the scientific enterprise of metaphorical language generated by models places it much more on a par than is usually recognised with, for example, the metaphorical language of the enterprise of theology in critically depicting the purported reality to which it seeks to refer.

Science and Technology as Human Explorations

Finally, for the young person to be well-educated 'humanly', there is a related pre-requisite in the way in which the sciences are taught, quite apart from what may transpire elsewhere in the school or university. It is the need for that exploration we call 'natural science' to be seen as a great *human* endeavour and achievement, a hazardous and personally costly enterprise that is dependent on human initiative and creativity. The format of the published scientific paper, and indeed of the text book, by a useful convention suppresses all the personal factors which led the investigator to conceive of the experiments, to struggle through their execution and to hammer out their consequences. The role of personal imagination and intuition in the development of concepts, models and hypotheses, often from sources quite extraneous to the systems under investigation, has been increasingly emphasised in recent years — particularly by scientists themselves writing on science. Many philosophies of the scientific method are often inadequate in the account they give of how new concepts, models and hypotheses actually arise in science and technology and are then selected from the multitude of possibilities or are replaced or modified. Extension, analogies and previously unthought-of juxtapositions of observations and ideas all seem to play their part, but the total act is itself often elusive and wholly personal. There are, of course, in the history of science many striking recorded instances of the role of the imagination in making a new creative synthesis of former ideas or sometimes an entirely new leap, for example, Kekule's half-dreaming of the ring form of benzene; Darwin's reading of Malthus and his joining of this with the idea of *natural* selection to provide the key to understanding evolution; and Watson and Crick's realisation that DNA is a double helix. Might not the whole atmosphere of the relation between the sciences and the humanities be transformed if the sciences were, once again, to be conceived as an aspect of *human* culture, as implied by their old-fashioned designation as 'natural philosophy'? And might not this attitude of *exploration* be partly conveyed, more than hitherto, by introducing young people — by history, biography and autobiography — to the mental and spiritual journeys of key non-scientific figures in the life of humanity as well as to the lives and thought processes of central, formative figures in scientific revolutions, such as Newton, Darwin and Einstein? Surely this would be better than the enormity that has disfigured the introduction of information technology to young people in my own country, at least, namely, the obscenity that this has occurred almost entirely through computer games centred entirely on *violent conquest*? Or, to put it another way (and as Socrates might have said today):

> Until humanists are technologists, or the scientists and technologists of this world have the spirit and power of the humanities, and technological greatness and wisdom meet in one, and those commoner natures who pursue either to the exclusion of the other are compelled to stand aside, cities will never have rest from their evils — no, nor the human race, as I believe — and then only will this our State have a possibility of life and behold the light of day.
>
> (cf. Plato, *Republic*, V)

THE COMMONWEALTH GOVERNMENT'S OBJECTIVES AND PRIORITIES FOR EDUCATION AND TECHNOLOGY

RICHARD JOHNSON

Introduction

I congratulate the Australian College of Education on its Silver Jubilee and the A.C.T. Chapter on its distinguished record, over 25 years, of involvement in and contributions to education.

I was particularly impressed by your conference theme — the Human Face of Technological Change. At a time when technology has developed so rapidly, it is appropriate to pause for a moment to consider the effects it may have on people. The breadth and scope of the topics you have chosen for your conference testify to your concern about these issues.

As Secretary of the Commonwealth Department of Education and Youth Affairs, I am most interested in the outcomes of this conference. No discussion of new technologies or technological change can take place without strong reference to education and to how it will affect all people, particularly our young people.

Mr Barry Jones has already spoken about the need to upgrade the skills base of Australia's workforce and the need to retrain employees as new technology is introduced into various industries. On this, your final day of the conference, I do not want to take up your time going over issues you have spent four days discussing. Instead, I would like to draw together the Federal Labor Government's objectives and priorities for education and technology and to outline some of the action the Government has already taken.

Education and Technological Change

Some twelve months ago, the National Economic Summit recognised that education is a crucial factor in assisting Australia's economic development. This recognition is particularly relevant to the area of technological changes taking place in society today.

The Government wants to establish a comprehensive strategy for initiatives to encourage the whole education system to stimulate, to shape and to respond adequately to technological and structural change.

The Government is determined to ensure the co-ordination of all Government programs, including those in the fields of education and training, which can have positive effects on future industry development. To this end, the Prime Minister established a Committee of Commonwealth Ministers to advise on the development of the Government's industry policies. The development of a Commonwealth strategy will, of course, need to involve a statement of goals and priorities, and proposed measures to achieve those goals. It will need considered and co-ordinated implementation of those measures, and it will need to monitor and evaluate the outcomes.

Technology and structural changes are of national concern and are matters on

which the Federal Government must demonstrate leadership and initiative. But they are also matters on which the Government must have the co-operation of the States. Education in Australia is the joint responsibility of the Commonwealth and the States, and the two levels of Government need to work together towards national objectives.

Task Force on Education and Technology

In November last year, the Commonwealth Minister and State Ministers for Education, meeting as the Australian Education Council, decided to establish a Task Force on Education and Technology, to be chaired by the South Australian Minister for Education, Mr Lynn Arnold. The Task Force will develop options for policy and program initiatives to assist and encourage the education system in stimulating, anticipating, shaping and responding to technological change and an increased level of technological innovation in Australia.

Its terms of reference will take into account the need to develop the capacities and skills required for individuals to play a productive part in the changing economic and social life of Australia, and to adjust to structural change. It will take into account the need to distribute these capacities and skills more equally than in the past, and it will take account of the effects of the application of technology on learning processes and achievements, and the quality of human relations both inside and outside the education system.

Technological change in education needs to be stimulated nationally to promote economic growth and employment growth. Without growth in these areas, the huge public investment in education will not produce an adequate return. Without such growth in community wealth and opportunities, the participation and equity objectives of the Government will end at the exit door of the education system. Those assisted will have been cheated if society provides opportunities only in education.

We need to shape technological change and to encourage and promote critical thinking about the benefits and costs of particular technological changes. It is important to raise community awareness of the potential for technological change to promote a more just and equitable distribution of the benefits of economic growth and development.

We must respond adequately to technological change. The education system as a whole must become more aware of the changing requirements for skills and capacities in Australian industry. Education is by any standards, an extremely large 'industry' in itself, involving total Government outlays in excess of twelve thousand million dollars. In the case of other industries, the pressures and incentives to modernise industry practices and methods are provided by the market place and competition in the market place. Education is not subject to these same competitive pressures. As a result, there is often a temptation to be complacent and, in some cases, disincentives to modernise and make cost-effective use of new technologies.

This is not acceptable for the future. The Education sector must accept its proper responsibility for assessing potential improvements to its organisation and methods and in the planning for implementation of these changes.

Computer Education

The Government is moving to introduce computer education into schools as

quickly and effectively as possible. This year the Government has provided $6.234 million, out of a total commitment of $18.7 million over three years from 1984, for computer education. In this we will be a partner with State Governments and non-government school authorities, sensitive to those emerging needs which can be met by central support and co-ordination.

The Government is making a national effort to bring about a high standard of technological awareness and skill among all Australian children. This is the way towards sharing the rewards of technological change among all Australians. The Government is approaching computer education in terms of a broad educational program rather than simply as an exercise in the provision of hardware.

Technology is already playing an increasingly important role in the delivery of education. Computing equipment is now standard in many schools and special provisions are being made to retrain teachers in this important area.

Improvements in the capacity of microelectronics and microprocessors have made it possible for handicapped people to be taught communication skills. Voice synthesisers for example, are helping those with severe speech problems and have obvious potential for blind people in education.

The advantage of such machines is that they allow children to be given interesting training without requiring the constant attendance of specialised teachers or therapists, and they allow the children to progress at their individual rates and levels through training and rehabilitation programs.

Educational Broadcasting and Television

Educational broadcasting is an area where technology has been used in education for many years. Educators in Australia have always seen the obvious benefits which radio technology could bring to us. They have used radio to meet the educational needs of those who are isolated from education facilities.

The advent of television introduced a new dimension to educational broadcasts. It gave access to an even wider spectrum of both formal and non-formal educational programs.

Satellite Technology

And now we are faced with another significant development — satellite technology. The Australian Government is, as you know, proceeding with the development of its AUSSAT domestic satelite facilities. This could usher in a whole new range of opportunities for educational broadcasting in both sound and vision.

It is not yet clear just how much use educators will be able to make of AUSSAT's facilities. The Department of Education and Youth Affairs certainly has a strong interest in identifying potential and cost-effective uses. We see possible uses extending well beyond enhancement of current School of the Air services, for example, to distance education at all levels. We could extend the distribution of teaching material and resources, and the linking of tertiary campuses for teaching purposes.

Other possible uses of a stellite system might include improving education services for the disadvantaged, including migrants, Aborigines and students in remote areas.

It could assist in adult and further education. It could assist in the co-ordination of curriculum development and offer new opportunities for the exchange of information between institutions, resource centres and ultimately individuals.

Several Australian institutions are also using satellite facilities to provide evening 'teletutorials' for external students. The Darwin Community College and some other institutions are particularly keen to investigate the potential of the AUSSAT system. A small team at the University of Western Australia is investigating the potential for using satellite technology for educational purposes at tertiary level. A Commonwealth/State advisory committee on the educational use of communications technology has also been established and has commenced some trial projects. Reports on the work of this committee are expected to be received at the next meeting of the Australian Education Council in June.

The potential of these technologies to expand participation and equity in education at all levels is enormous. The potential to do this in a more cost-effective manner than conventional educational provision — like the bricks and mortar of new buildings — is one of the vital aspects of technology that the education system must examine. Its potential to break down existing barriers between sectors of education, and individual institutions is also enormous.

Imaginative and innovative, but most importantly, co-operative approaches will be needed to exploit this potential. Your contribution from this Conference will be a valuable input to the Government's efforts for development in these areas.

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